NeuroFeedBack User Manual

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A Tutorial on How to Work with NeuroFeedBack

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Chapter 1

Introduction

1.1 What Is NeuroFeedBack?

Have you ever seen people who suffer from unwanted behavioral patterns but still refuse to see psychotherapists out of the fear of drugs and side effects? Have you ever looked for a non invasive and drug free way to train the brain to self regulate itself and improve your mood, behavior, learning patterns and physical symptoms? This is exactly where NeuroFeedBack comes in. NeuroFeedBack provides a safe way for people to improve their brain activity by training their wave brains , decreasing the power or amplitude of some undesirable frequency bands and increasing the desirable ones. Providing distinct protocol for each individuals by a therapist, NeuroFeedBack gives feedback to clients that how much they were successful in improving their brain waves by giving them a reward such as playing a movie or Game. Receiving appropriate feedback about its behavioral patterns, the automatic brain's self-regulating organ is trained to correct itself and to strengthen its functionality.

Figure 1.1 NeuroFeedBack can promote brain functionality

1.2 How Does It Affect Brain?

Is this like a fiction that a person can learn how to regulate his brain waves and promote his brain functionality? But you have experienced it before when you first learned how to ride a bicycle! That time, your brain learned how to self-regulate your state of balance during biking using the feedback it was being received from gravity. Just like your eyes who helped your brain learn how to bike, NeuroFeedBack send feedback to the person about his current brain status and how much it is in order using games and movies. It needs no effort from you, rather it is the central nervous system that decides to reorganize neural connections to modify the function of those parts. While you are seeing movie or playing games, your subconscious brain is going to modify itself based on the information it received during interruption in game or movie. For clients, it seems like a miracle when they saw how symptoms are diminished in their lives. This is the power of their brain that beyond their conscious awareness process more

Figure 1.2 Just like Gym that helps your muscles get stronger, NeuroFeedBack helps your brain strengthen itself to work in a more efficient way.

information than what their mind can handle from a software and constantly send commands to correct itself. Interestingly enough, this method has been both scientifically and empirically proved to be effective and has been increasingly practiced by specially trained psychotherapists.

1.3 Who Can Benefit?

Everyone can benefit from NeuroFeedBack therapy just like going to the gym that can be useful for anyone. It is practical for any age from children who suffer from learning problems to adults who like to be at their peak performance in their work and for elders who want to keep their brain abilities as they age.

NeuroFeedBack can be used to improve attention, cognitive abilities, and emotional regulations. It has been used in numerous disorders including depression, attention deficit disorder, anxiety, sleep disorders, headaches and migraines, and other emotional issues. It can also be used for organic brain disorders, such as autism, cerebral palsy, seizures, stroke, and traumatic brain injury. it can also be helpful for people who struggle with drug and alcohol use and conditions like mood swings and PMS.

1.4 How Does It Work?

Brain activities monitored by neurofeedback trainer
Electrical sensors on scalp and ears
Feedback as a computer game

Figure 1.3 NeuroFeedBack setup

It works in some steps:

- The therapist provides a unique protocol for you according to your type.
- He puts some sensors in specific location of your scalp to sense the electrical activity (known as EEG) of those particular parts of your brain.
- You sit in front of a movie or game and very relax just see or play with your brain.

- The software analyze your EEG signals to determine if your sate of the brain is in order or not or how much it is deviated from the normal.
- The software gives you feedback about your brain status by stopping or resizing the movie or game. For example, whenever your brain waves are in order the movie is played with large screen giving your brain reward for its positive performance. Whenever it is out of order, the movie is stopped or its size is decreased.
- The reminding happens automatically and unconsciously! no need for you to do anything else. Your brain do everything is needs to do! using this feedback it realized that there is a problem in some parts of the brain and instantly tries to alter that!
- Just wait and see how it creeps in your life and enhance your behaviors!

Chapter 2

Getting Started

2.1 eWave at a Glance

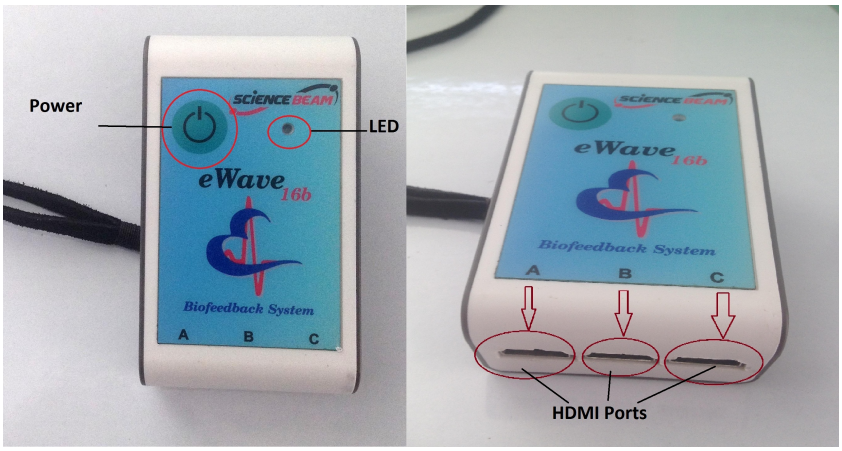

Figure 2.1 eWave

- Power: Press the Power button for 3 seconds to turn the device on or off.
- LED: The LED has different colored each of which has a special meaning :
  Green color: when you turn the device on
  Blinker Green Color: when the hardware connects and starts transferring data.
- Charge Pin: Push the charger plug in this pin to charge the battery. You need to charge it for 3 hours for every 10 hours work. Note that you can only use or charge it at a time. when you are charging the battery, it automatically stops working.
- HDMI port A: This port covers 8 channels from 1 to 8.
- HDMI port B: In eWave 16b, this port covers 4 channels from 5 to 8 that is similar to the 5 to 8 channels in port A. In eWave 22b, this port covers 8

channels from 9 to 16.

- HDMI port C: This port is for programming and connecting other devices.

2.2 Setup eWave

2.2.1 Add Bluetooth Device

- Press the power button for 3 second to turn on the device. The LED is turned on with green color.
- Click **Start** in the windows and then **Devices and Printers**.

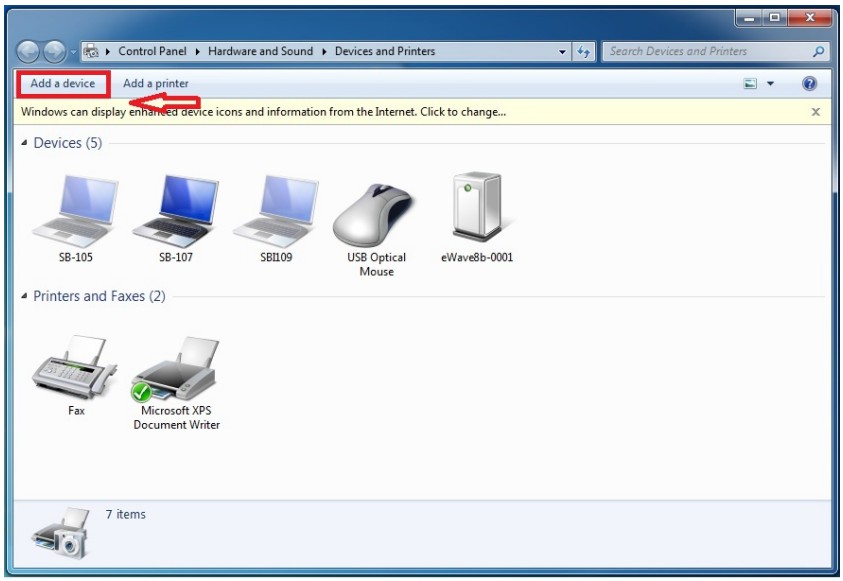

Figure 2.2 Add Device Window

- Click **Add a Device** on the right top of the window.
- Wait for your device to be detected.
- When your device is detected click on the device and then **Next**.

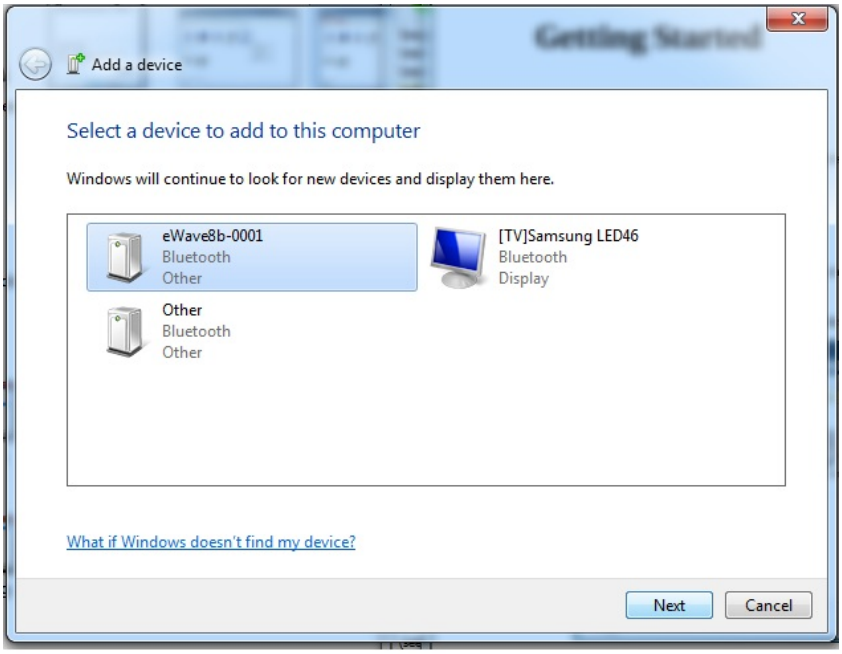

Figure 2.3 Detecting Device

- On the verifying code click on **Yes** and then **Next**.

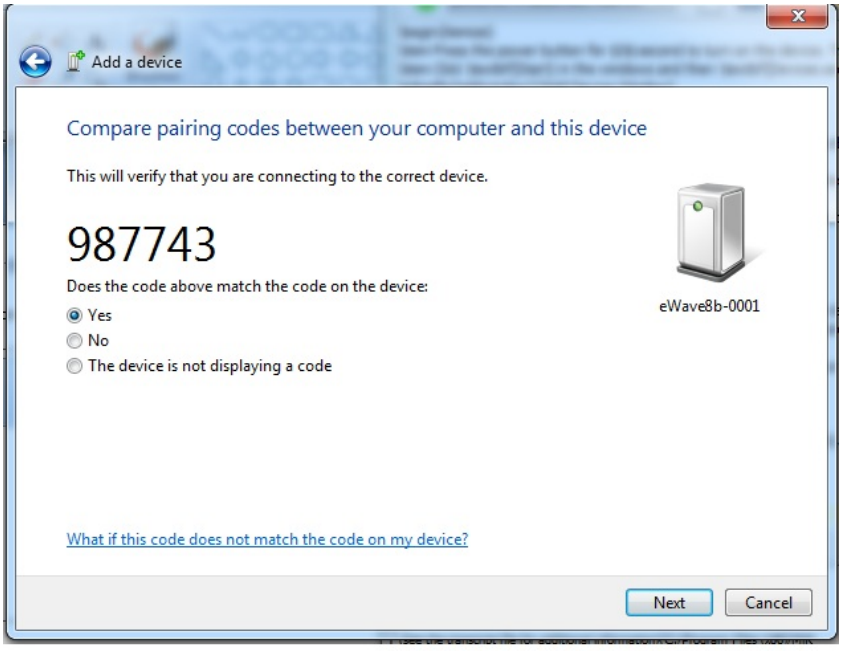
Add a device
Compare pairing codes between your computer and this device
This will verify that you are connecting to the correct device.
987743
Does the code above match the code on the device:
Yes
No
The device is not displaying a code
eWave8b-0001
What if this code does not match the code on my device?
Next
Cancel

Figure 2.4 Detecting Code

- Click **Close**

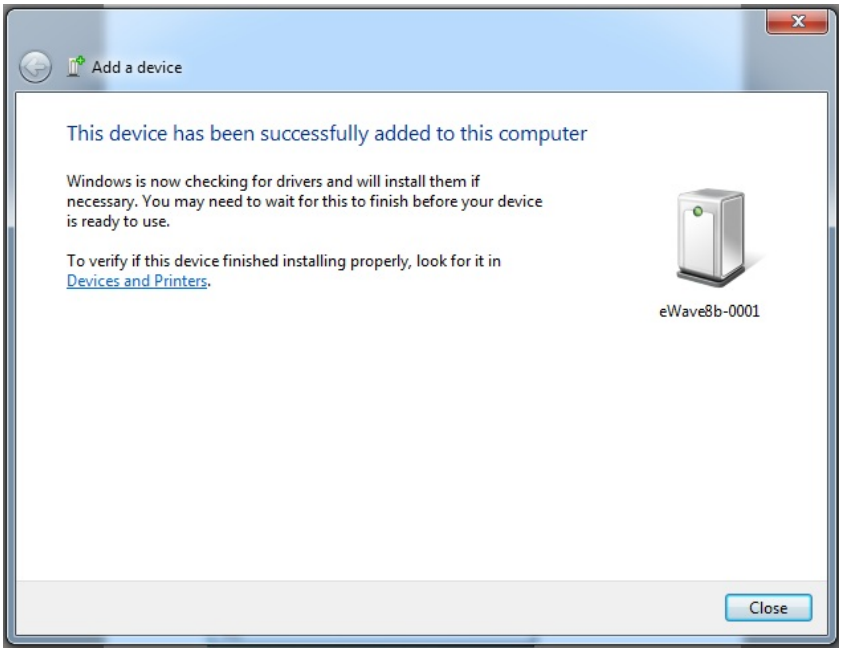
Add a device
This device has been successfully added to this computer
Windows is now checking for drivers and will install them if necessary. You may need to wait for this to finish before your device is ready to use.
To verify if this device finished installing properly, look for it in Devices and Printers.
eWave8b-0001
Close

Figure 2.5 Adding device

2.2.2 Detecting the Number of Serial Comport

- Press the power button for 3 second to turn the device on. The LED is turned on with yellow color.
- Click **Start** in the windows and then **Devices and Printers**.
- Click **Add a Device** on the right top of the window.
- Under the item **Devices**, right click on the name of your device form the list.
- Click on **Properties**.

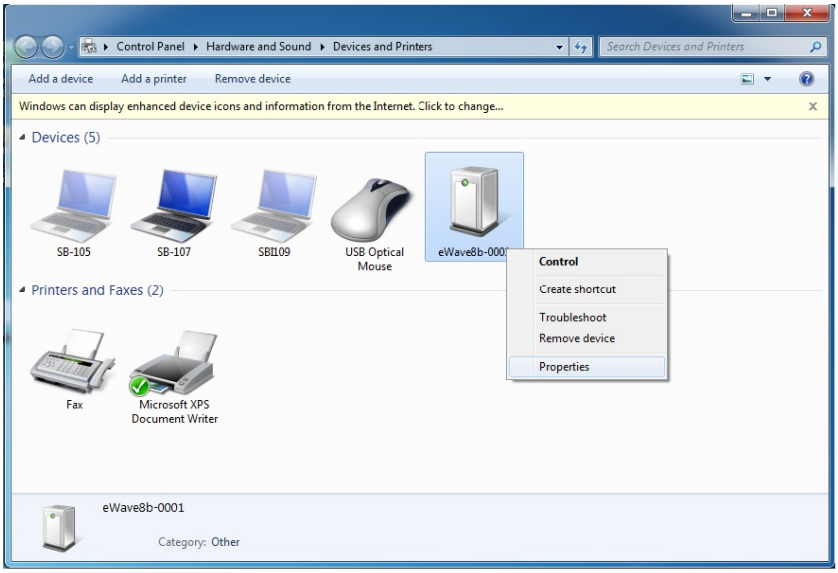

Figure 2.6 Properties Table

- Click on **Hardware**.
- Under the **Device Functions**, under the **Name**, you can see the name of the comport (Fig. 2.7).

2.3 Installing NeuroFeedBack

2.3.1 Minimum Requirements

To work with NeuroFeedBack software you should have a computer setup with

Requirements

- At least a dual core CPU
- At least 2*G* RAM
- Windows Seven (other windows like windows eight or windows XP is not supported.)

2.3.2 Installation Folder

You get this software with two folders: **eProbe** and **Protocols**.The **eProbe** consists of the installation program *eProbe.exe*, *activation.txt* and other files that is internally used by software. The **Protocols** Folder consists of some folders and text files that you need:

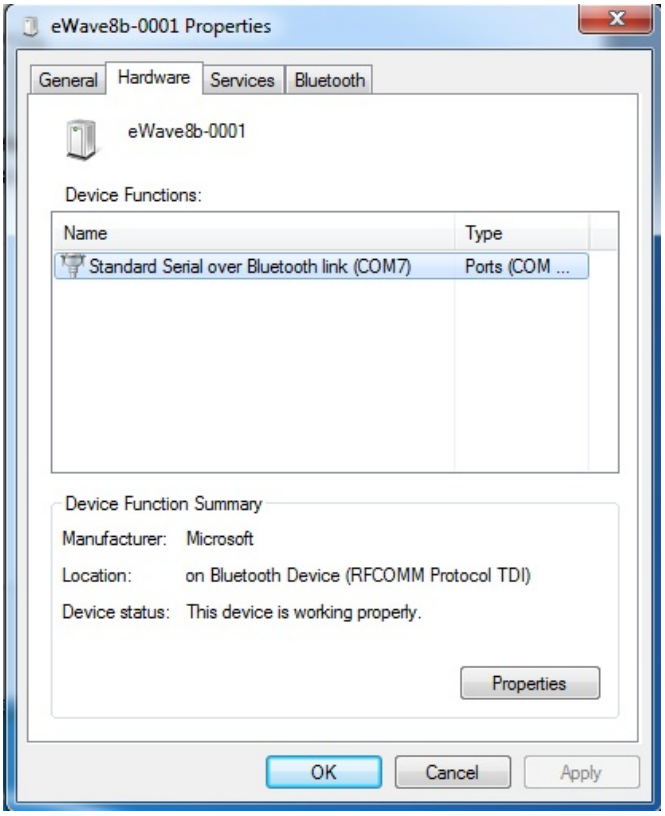

Figure 2.7 finding Comport of the device

☞ You should put every new protocol, file or folders that you want to add in the right folder.

File and Folders You Need

- **Protocols**: some sample protocols that you can use for specific disorders. You can later make your own protocols.
- **Anim**: some folders and files for the *Animation* type of the *Game* panel.
- **Image** : some image files for the*Image* panel.
- **Movie**: some movie files for the *Movie* type of the *Game* panel.
- **Video**: some video files for the *Movie* type of the *Game* panel.
- **Game**: some game files for the *Game* type of the *Game* panel.

2.3.3 Activate and Run NeuroFeedBack

The first thing to do in using NeuroFeedBack is to activate the software:

- Double click on **eProbe.exe** in the **eProbe** Folder.
- Click on the item **About eProbe** and then click **About eProbe** button at the top.

Figure 2.8 Activate NeuroFeedBack

- Send the serial number in the opened window to register@ScienecBeam.com and get product activation file.

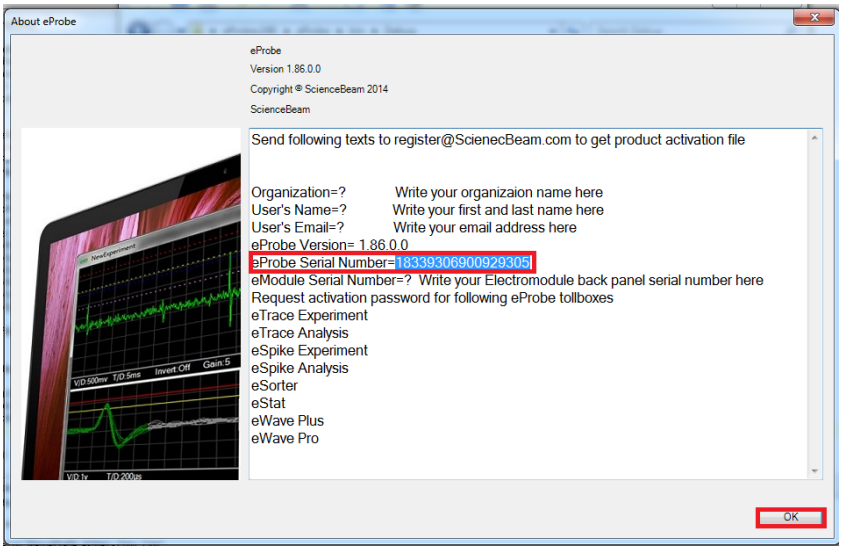

Figure 2.9 Serial Number

- Copy the **activation.txt** in the **eProbe** Folder. You can also enter the activation number in the **activation.txt** and save it.

☞ For each computer setup you need a specific activation number.

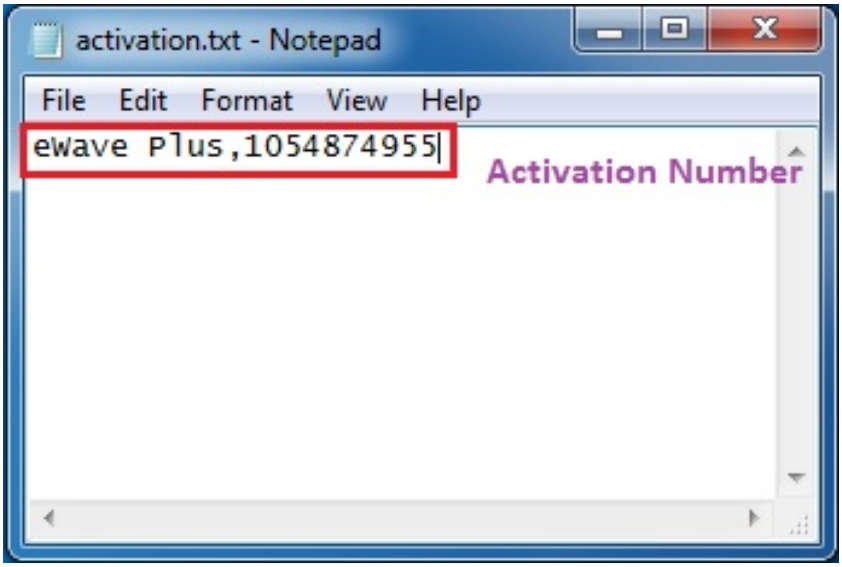

Figure 2.10 Activatation Number

- Double click on **eProbe.exe**. The eProbe Demo is opened.

Figure 2.11 rProbe Demo

- Click on **eWavePlus** in the eProbe Demo. The main menu is now opened.

Figure 2.12 Main Menu

- Click on **File** > **Open Protocol** to open a protocol. (You can also make your protocol using **File** > **New Protocol**.)
- A Sample protocol like this one is opened:

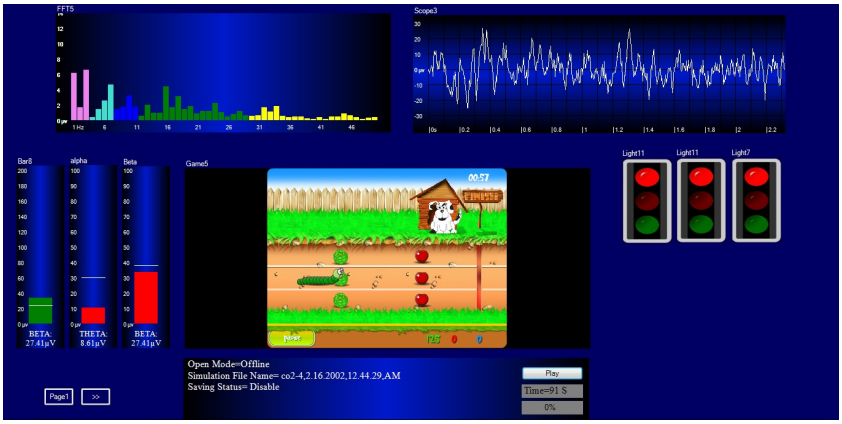

Figure 2.13 Sample Protocol

Chapter 3

Working with a Sample Protocol

In this Chapter, we show you how you can open a sample protocol and use different panels. We introduce you different components, known as panels, that you can later use in your own protocols to receive data, show signals and analyze them, play game and so on.

3.1 Main Menu

The first time you run the **eProbe.exe** software a simple menu like Fig. 3.1 opens. You can open an existed protocol or create a new one using **File**.

Figure 3.1 Main Menu

Click on **File** and then **Open Protocol** to open a **.txt** file name as protocol.

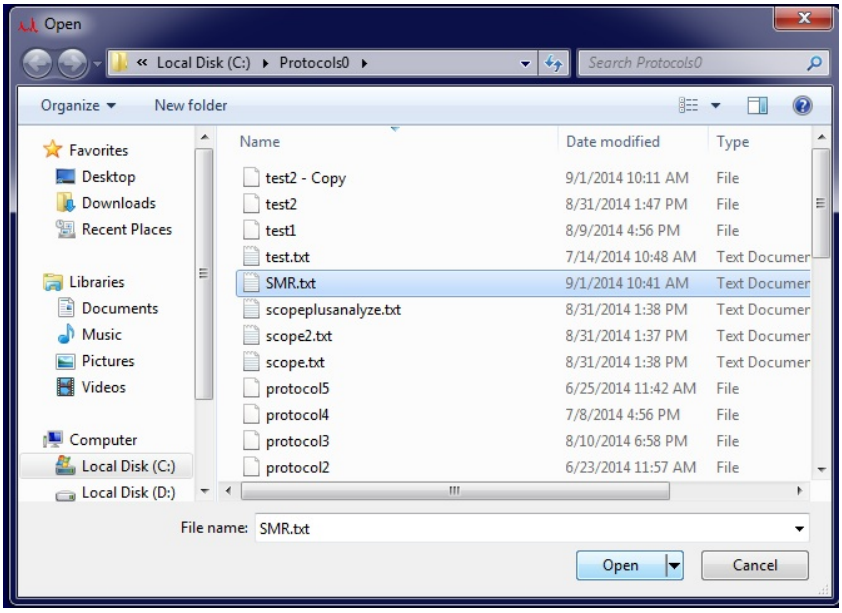

Figure 3.2 Open Protocol

You can see the sample protocol in Fig. 3.3

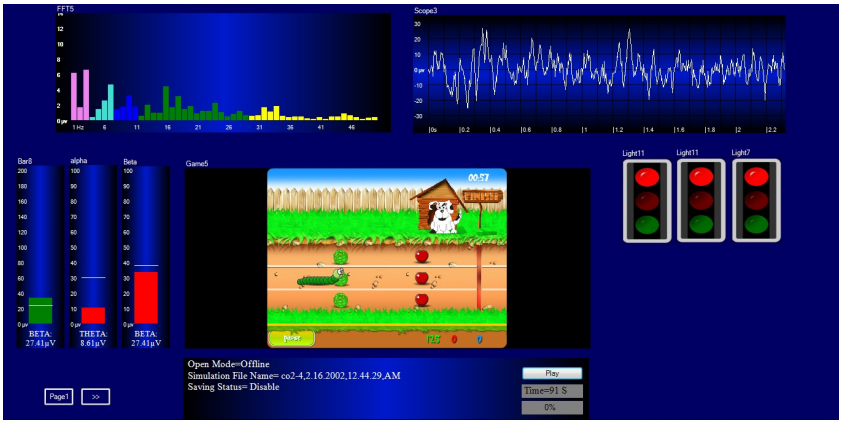

Figure 3.3 Sample Protocol

3.2 A Sample Protocol Components

In this section, we introduce you different components of the protocol that you can use during or after each session to play or analyze data. You can see the sample protocol in Fig. 3.4

Figure 3.4 Sample Protocol Components

Different Panels

- **PlayBox**: receives or opens recorded data and controls playing of different panels.
- **Scope**: displays the signal both in time and frequency domain.
- **Val**: displays the square of the FFT power of a specific band. This value is the summation over the frequency bins of the band.
- **FFT**: displays the square of the instantaneous FFT power of a specific band. This value is displayed for each frequency bins of the band.
- **Text**: displays some pure information or the result of the analyze panel.
- **Image**: shows image.
- **Game**: plays video, movie or game.
- **QEEG**: shows the instantaneous Quantitative Electroencephalograph (QEEG) or Brain map of a specific band.
- **Bar**: shows weather the square of the instantaneous FFT power of a specific band is beyond or less than the threshold and considers it as a logic for the Game panel. Here, the FFT power is the summation over the frequency bins of the whole band.
- **Light**: compares the square of the instantaneous FFT power of a specific band with two thresholds and shows it with green, orange or red color.
- **Analyze**: displays the whole signal and shows the FFT power of each of the bands that you want in a text panel.

Chapter 4

Page

4.1 Page at a Glance

Every Page provides you with a context to add different panels. It consists of the Back, Next and Page buttons.

Figure 4.1 Page

Page Components

- **Page Button**: shows the name or number of the page. Using this button you see and change the name or number of the page and jump to other pages.
- **Next Button**: go to the next page.
- **Back Button**: go back to the previous page.

4.2 Page Setting Table

It provides you with some items to change the properties:

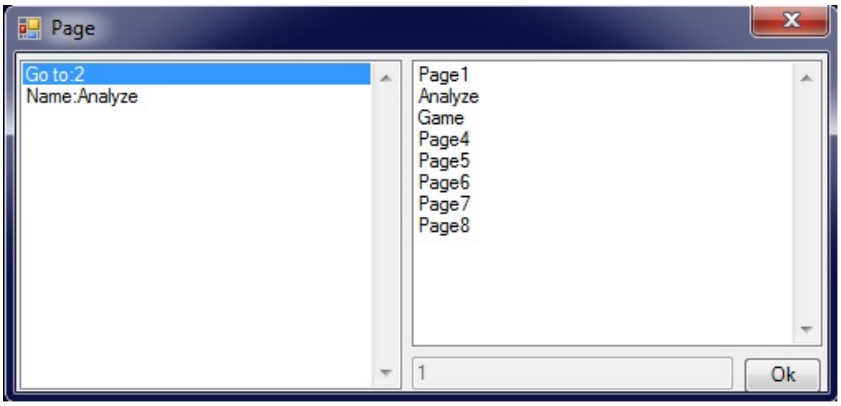

Figure 4.2 Page Setting table

- **GoTo**: If you want to jump to the specific page you can directly select the name or number of the page using this item and pass over the next pages.

Extra Items

You can see some other options during **EditMode** (When you have pressed the **E** key on the keyboard and you can see **Edit toolbar** in the screen) including:

- **Name**: You can change the name of the Page and use the name instead of the number of the page. This name appears in the **Page button**.

Figure 4.3 Edit Toolbar

4.3 Make a New Page

- Run the **eWave Probe** to open the main menu.
- Click **File** > **Open Protocol** to open a protocol or **File** > **New Protocol** to create a new protocol. An editable page opens.
- Press **E** key on the keyboard. The **Edit Toolbar** (Fig. 4.3) appears in the left side of the page.
- On the **Edit Toolbar**, Click on **Page**.
- Click on the current the page.

- The new page is now made after the current page and the number of all pages is automatically changed.

Figure 4.4 Making a new page

4.4 Jump to a New Page

- Right click the Page button to open the setting table.
- Click on **Goto** in the left pane.
- Select the name or number of the page you want in the right pane.

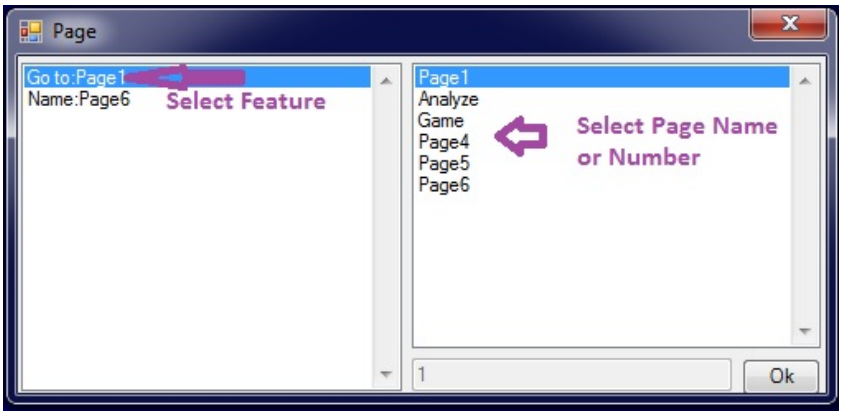

Figure 4.5 Page setting table, jump to another page

- Click on **Ok**.
- The selected page is opened.

4.5 Change the Name of the Page

- If the **Edit Toolbar** does not present in the page, press **E** key on the keyboard to see it. Now, you are in **Edit Mode** and you can modify the name of the page.
- Right click the Page button to open the setting table.
- Click on **Name** in the left pane.
- Type the name you want.

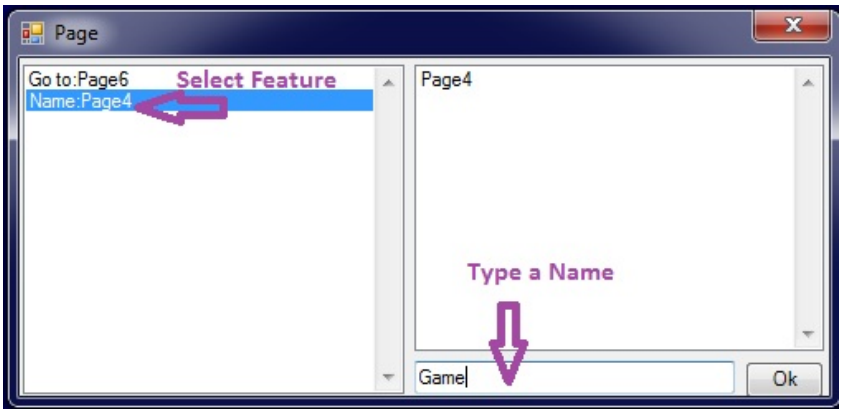

Figure 4.6 Page setting table, change the name of the page

- Click on **Ok**.
- The name of the page is now changed.

Chapter 5

PlayBox

5.1 PlayBox at a Glance

This panel helps you receive data through eWave hardware, open a previously recorded data, start playing games, displaying signals and calculating FFT values. You can get some information about the data such as the name of the data, the type of data acquisition (online or offline) and the name of the recording file if it is saving. You can also see the current time of the signal, the level of the battery and the current comport in this panel.

Figure 5.1 PlayBox

PlayBox Components

- **Play Button**: starts playing games, displaying signal and FFT value on the Scope, Bar, light and Val panels.
- **Current Time**: shows the current time of the data being displayed.
- **Battery Level**: Shows the percentage level of the battery charge.
- **OpenMode:**
  Offline shows you are playing a previously recorded data.
  eWave shows you are receiving data through eWave Hardware.
- **Current Comport:** shows the comport that linked your hardware to the software. It is shown only when you are in **eWave OpenMode**. It should be the corresponding comport of your device connection (see sec. 2.2.2).
- **Saving Status**:
  Enable: shows that the data you are playing are currently recording with the name specified in **Recording File Name**.
  Disable: shows that the data is NOT recording.

- **Recording File Name**: shows the name of the recording data that you can later open in **Offline OpenMode**. It is shown only when the **Saving Status** is **Enable**.
- **Simulation File Name**: shows the name of the previously recorded data that you are currently playing in **Offline OpenMode**. It is shown only when you are in **Offline OpenMode**.

5.2 PlayBox Setting Table

It provides you with some items to change the properties:

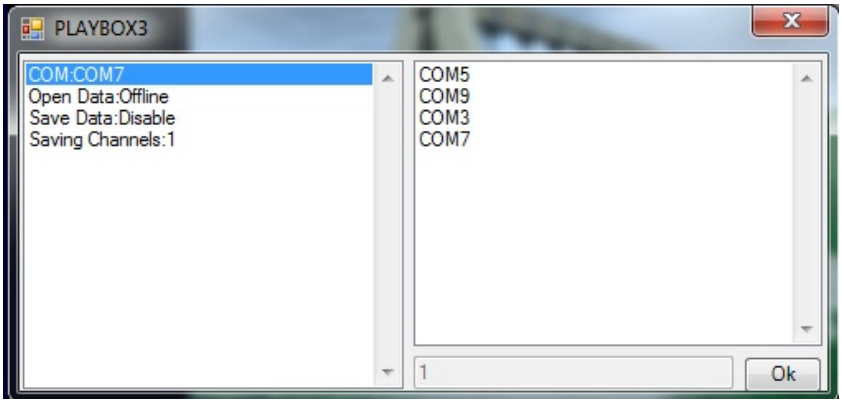

Figure 5.2 PlayBox Setting

- **COM**: You can select the serial comport of your device from the list.
- **Open Data**: You can select one of the items below:
  Browse to open a recorded data.
  eWave to receive data through eWave Hardware.
- **Save Data**: You can select one the items below:
  Browse to save the recording data with the name and in the location you want.
  Disable to prevent data from saving.
- **Saving Channels**: You can select one or multiple channels that you want to save.

Extra Items

You can see some other options during **EditMode** (When you have pressed the **E** key on the keyboard and you can see **Edit toolbar** in the screen) including:

- **H**: You can change the height of the panel.

- **W**: You can change the height of the panel.
- **X**: You can change the position in x-axis.
- **Y**: You can change the position in y-axis.

5.3 Make a New PlayBox Panel

- Run the **eWave Probe** to open the main menu.
- Click **File** > **Open Protocol** to open a protocol or **File** > **New Protocol** to create a new protocol. An editable page opens.
- Press **E** key on the keyboard. The **Edit Toolbar** (Fig. 5.3) appears in the left side of the page.
- On the **Edit Toolbar**, Click on **PlayBox**.
- Click on the position of the page that you want to place the panel.
- The PlayBox panel is now made. You can change the size and position of the panel to the values you want.

Figure 5.3 Edit Toolbar

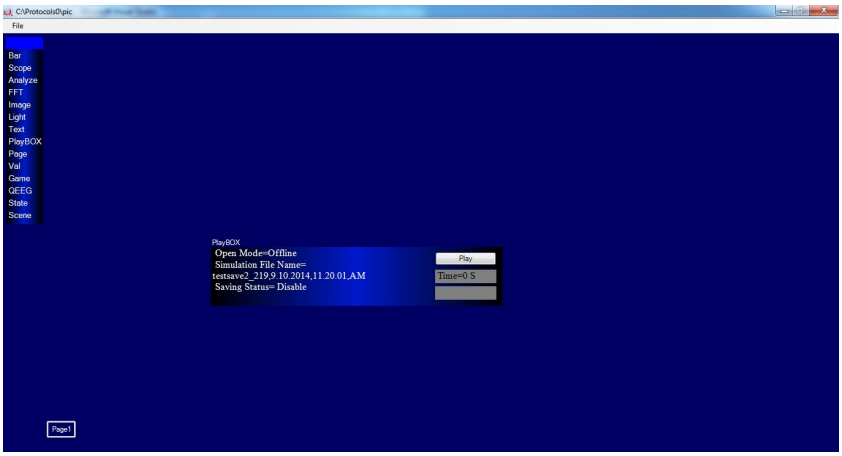

Figure 5.4 Making a PlayBox Panel

5.3.1 Changing Size and Position

- If the **Edit Toolbar** does not present in the page, press **E** key on the keyboard to see it. Now, you are in **Edit Mode** and you can modify the panel.
- Click on the borders of the panel and drag the mouse to resize it.
- Click on the center of the panel and drag the mouse to move it.

☞ You can edit panel only when you are in **Edit Mode** .i.e. you have pressed the **E** key on keyboard and you can see **Edit Toolbar** in the page.

☞ You can see these extra features in the setting table only when you are in **Edit Mode**.

An Alternative Way

If you want to specify the exact value of size and position do the following:

- If the **Edit Toolbar** does not present in the page, press **E** key on the keyboard to see it.
- Right click on the panel to open the setting table.
- Click on the item **H**, to change height, and type the value you want.

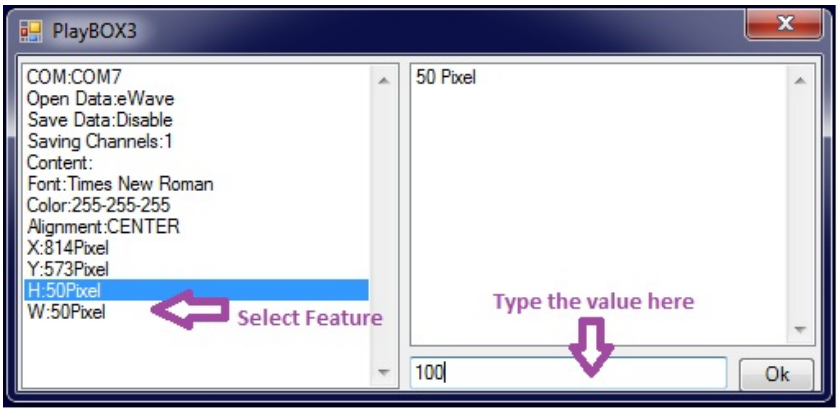

Figure 5.5 PlayBox setting table, change the size and position

- Click on **W**, to change width, and type the value you want.
- Click on **X**, to change the position in x-axis, and type the value you want.
- Click on **Y**, to change the position in y-axis, and type the value you want.

5.4 Read Data through eWave Hardware

- Right click on the panel to open the setting table.
- Click on **COM** in the left pane and select the corresponding comport in the right.

☞ If you do not know which comport to select see sec. 2.2.2.

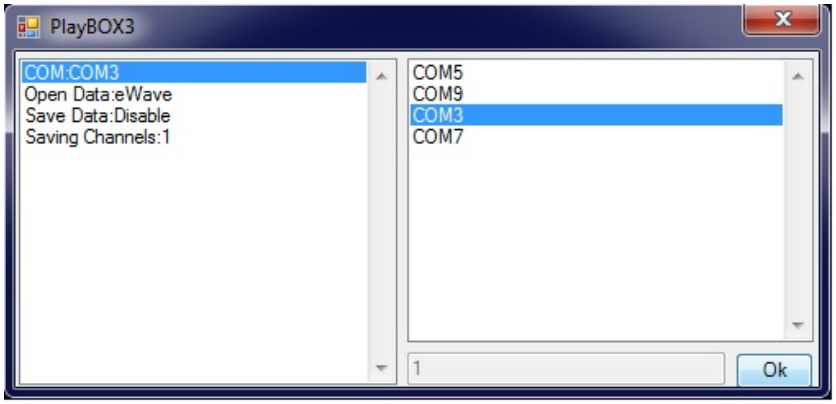

Figure 5.6 PlayBox setting table, select comport

- Click on **Open Data** in the left pane and select **eWave** in the right.

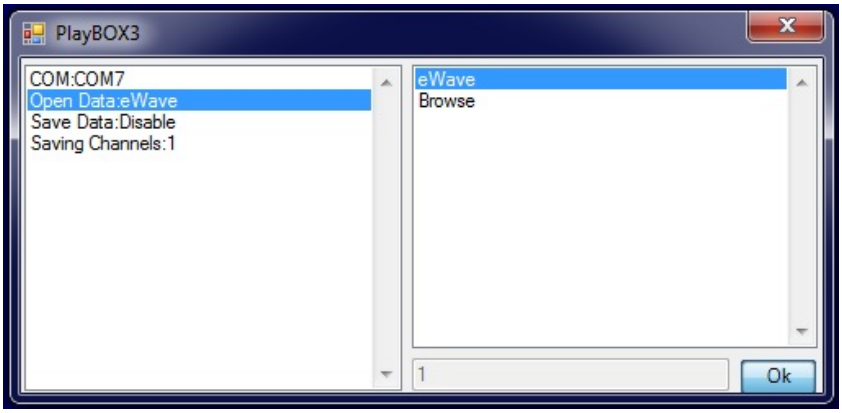

Figure 5.7 PlayBox setting table, read Data through eWave

- Click on **Ok**.
- Click on **Play** button on the PlayBox panel to receive data.

> **NOTE**
> You may receive an error message: "Device is not connected". Check your eWave connection and try again.

Look at the Information

you can see the information about current status of play in the PlayBox.

Figure 5.8 PlayBox Panel

- **Open Mode**: **eWave** shows you are receiving data from eWave hardware.
- **Current Comport** shows the name of the file that you are playing. It is shown only when open mode is eWave.

5.5 Read Previously Recorded Data

- Right click the panel to open the setting table.
- Click on **Open Data** in the left pane and select **Browse** in the right.

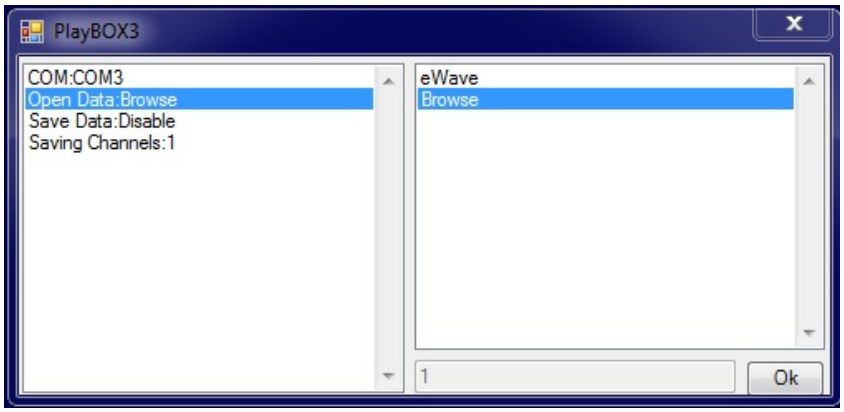

Figure 5.9 PlayBox setting table, open a recorded file

- Browse on the data that you want to read and click **OK**.

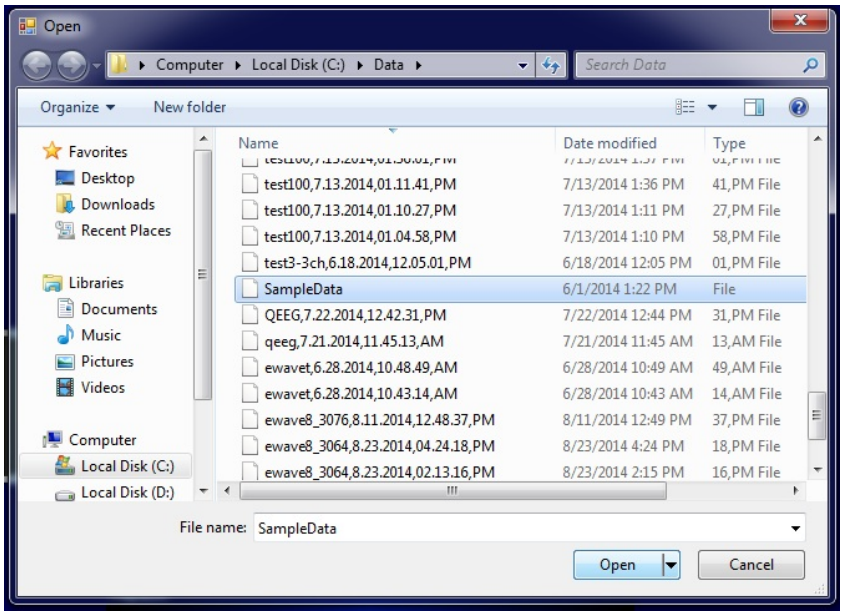

Figure 5.10 Open dialog box, open a recorded file

- Click on **Open**.
- Click on **Play** button on the PlayBox panel to display data.

Look at the Information

you can see the information about current status of play in the PlayBox.

Figure 5.11 PlayBox Panel

- **Open Mode**:**offline** shows you are playing a simulation data.
- **Simulation File Name** shows the name of the file that you are playing. It is shown only when OpenMode is Offline.

5.6 Save Data

- Right click the panel to open the setting table.
- Click on **Save Data** in the left pane and select **Browse** item in the right.

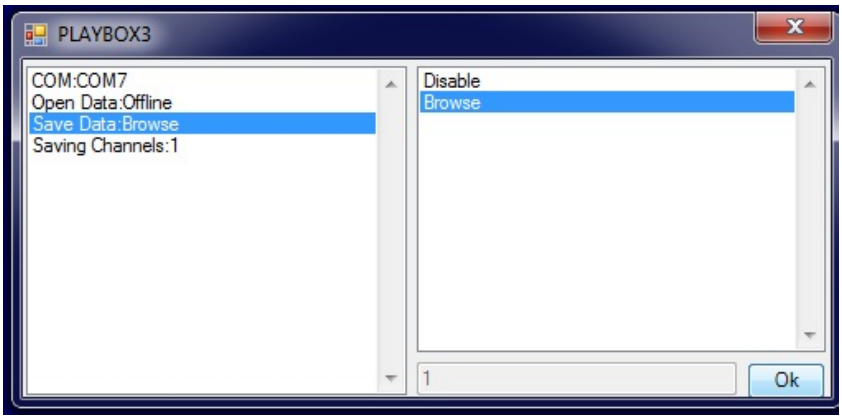

Figure 5.12 PlayBox setting table, save data

- Click **Saving Channels** in the left pane and select number of each of the channels that you want to save in the right.

☞ If you do not want to save data, simply select **Disable**. Or else, all of the data you are playing in different times are recorded. In this case, you have many stored data with the same prefix and different suffixes according to their time of recording.

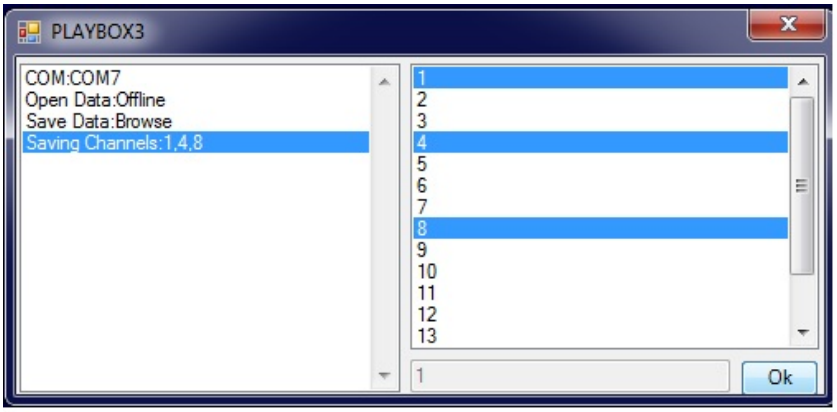

Figure 5.13 PlayBox setting table, select saving channel

- Enter the name that you want and click **Save**.

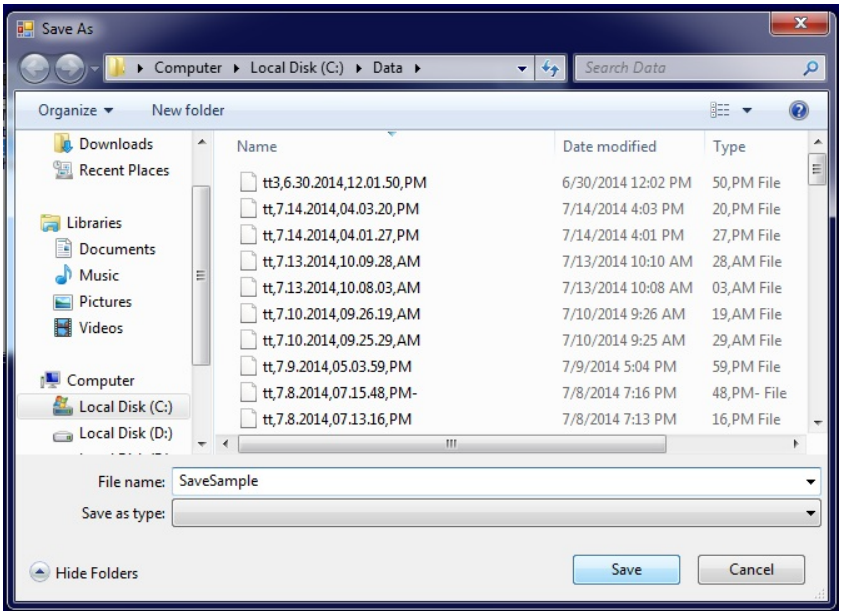

Figure 5.14 Save dialog box, save data

- Click on **Open**.
- Click on **Play** button on the PlayBox panel to show data.

NOTE

Saving your data, the software automatically adds date and current time to the name you enter.
So, you can have multiple file with similar names and can find your data based on the time you have recorded it.

Look at the Information

you can see the information about current saving status in the PlayBox.

Figure 5.15 PlayBox panel

- **Save Status** is **Disable** the data is not recording or **Enable** if it is recording.
- **Recording File Name** shows the name of the file that you want to save. It is shown only when save status is enable.

5.7 Get information from the PlayBox Panel

You can see the current status of your recording in the play box pannel using the following items:

- **Play Button** is **Stop** if you are playing and **Play** if not.
- **Time** shows the time of the data in second.
- **Battery** shows the percentage level of battery charge.
- **Open Mode** is **offline** when you are playing a simulation data or **eWave** when you are receiving data from eWave hardware.
- **Current Comport** shows the name of the file that you are playing. It is shown only when open mode is eWave.
- **Simulation File Name** shows the name of the file that you are playing. It is shown only when OpenMode is Offline.
- **Save Status** is **Disable** the data is not recording or **Enable** if it is recording.
- **Recording File Name** shows the name of the file that you want to save. It is shown only when save status is enable.

Chapter 6

Scope

6.1 Scope at a Glance

You can see the signal both in time and frequency domain in the **Scope**.

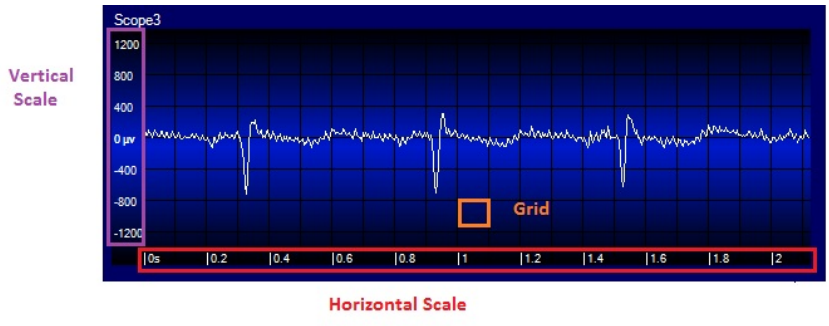

Figure 6.1 Scope

6.2 Scope Setting Table

In the scope setting table you can see some items to change:

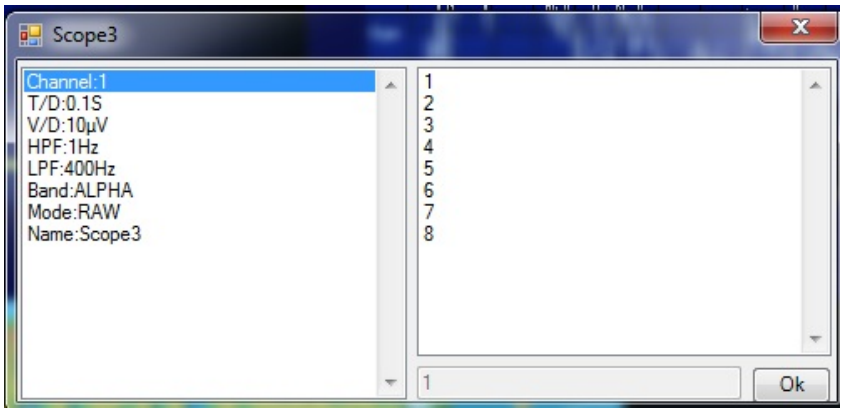

Figure 6.2 Scope Setting

- **Channel**: You can select the channel you want to see.
- **V/D**: The amplitude of the signal may be in different scales such as μv, mv or v. The signal maybe too small or too large to be seen in the scope. Therefore, you need to change the vertical scale (Volt/Division) using **V/D**. Note that each value you select is equal to one of the grids in vertical axis.
- **T/D**: You may need to see the details of the signal in μs scale or see the whole signal in s. So you can change how much the data is compact in horizontal scale.
- **HPF**: You can implement a high pass filter to eliminate the high frequency signals or noises. You can select the cut of frequency of the high pass filter using item **HPF**.
- **LPF**: You can implement a low pass filter to eliminate the low frequency signals or noises. You can select the cut of frequency of the low pass filter using item **LPF**.
- **Mode**: You can see the raw signal in time or see the instantaneous FFT of the signal by selecting the **RAW** or **FFT** mode respectively.
- **Name**: You can change the name of the panel using this item.

Extra Items

You can see some other options during **EditMode** (When you have pressed the **E** key on the keyboard and you can see **Edit toolbar** in the screen) including:

- **H**: You can change the height of the panel.
- **W**: You can change the height of the panel.
- **X**: You can change the position in x-axis.
- **Y**: You can change the position in y-axis.

Figure 6.3 Edit Toolbar

6.3 Make a New Scope Panel

- Run the **eWave Probe** to open the main menu.
- Click on **File** > **Open Protocol** to open a protocol or on **File** > **New Protocol** to create a new protocol. An editable page is opened.
- If the **Edit Toolbar** does not present in the page, press **E** key on the keyboard to see it. The **Edit Toolbar** (Fig. 6.3) is appeared in the left side of the page.
- Click on the item **Scope** to select it.

- Click on the position of the page that you want to place the panel.
- The scope is made in the page. You can then change the size and position of the panel to the value you want.

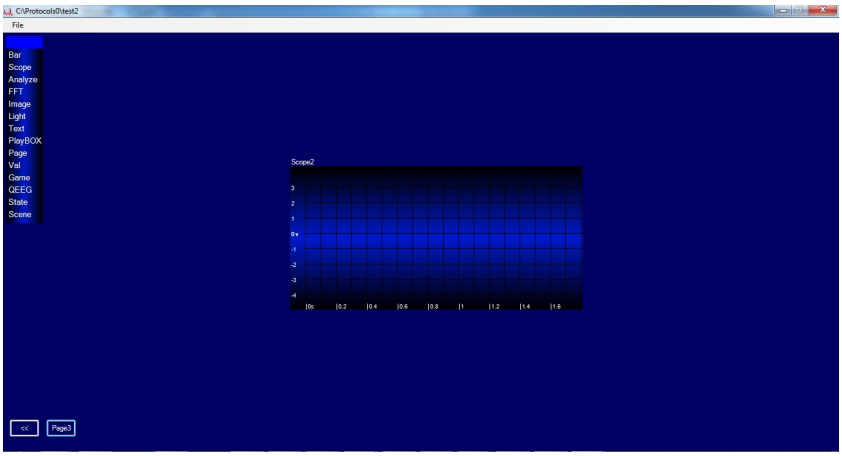

Figure 6.4 A scope panel is made in the page.

6.3.1 Changing Size and Position

- If the **Edit Toolbar** does not present in the page, press **E** key on the keyboard to see it. Now, you are in **Edit Mode** and you can modify the panel.
- Click on the borders of the panel and drag the mouse to resize it.
- Click on the center of the panel and drag the mouse to move it.

☞ You can edit panel only when you are in **Edit Mode** .i.e. you have pressed the **E** key on keyboard and you can see **Edit Toolbar** in the page.

An Alternative Way

If you want to specify the exact value of size and position do the following:

- If the **Edit Toolbar** does not present in the page, press **E** key on the keyboard to see it. Now, you are in **Edit Mode** and you can modify the panel.
- Right click on the panel to open the setting table.
- Click on **H**, to change height, and type the value you want.

☞ You can see these extra features in the setting table only when you are in **Edit Mode**.

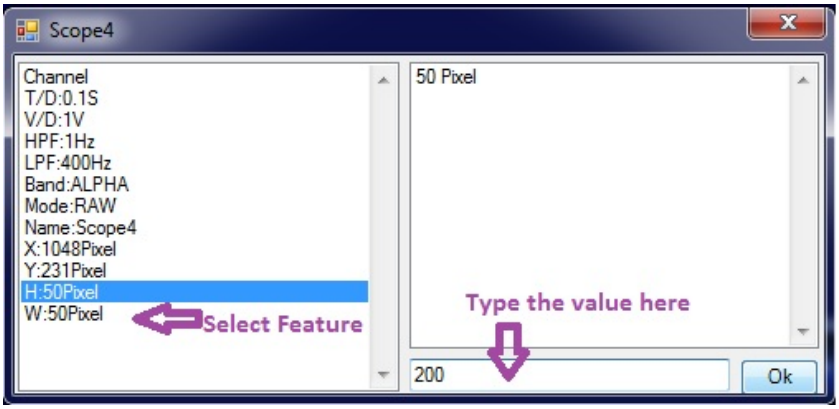

Figure 6.5 Scope setting table, change the size and position

- Click on **W**, to change width, and type the value you want.
- Click on **X**, to change the position in x-axis, and type the value you want.
- Click on **Y**, to change the position in y-axis, and type the value you want.

6.4 Select Display Setting

6.4.1 Select Channel to Display

- Right click on the panel to open the setting table.
- Click on the item **Channel** on the left side of the table to change the channel.

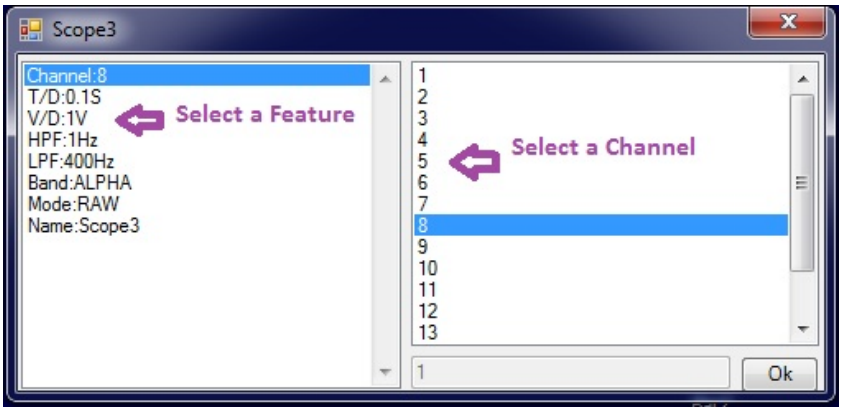

Figure 6.6 Scope Setting table, select channel

- Click on one of the items on the right side of the table and select the channel you want to display.

6.4.2 Select Display Mode

You can see data both in time and frequency domain in scope using **Raw** and **FFT** mode respectively.

- Right click on the panel to open the setting table.
- Click on the item **Mode** on the left side of the table to change the display mode.

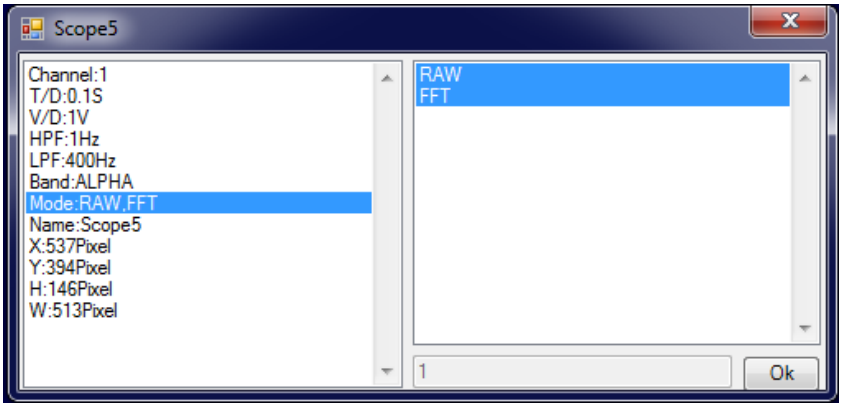

Figure 6.7 Scope Setting table, select display mode

- Click on the **RAW** to see the raw data or **FFT** to see the instantaneous FFT of the data or both **FFT** and **RAW**.

6.4.3 Select Horizontal Scale

- Right click on the panel to open the setting table.
- Click on the item **T/D** on the left side of the table to change the horizontal scale.

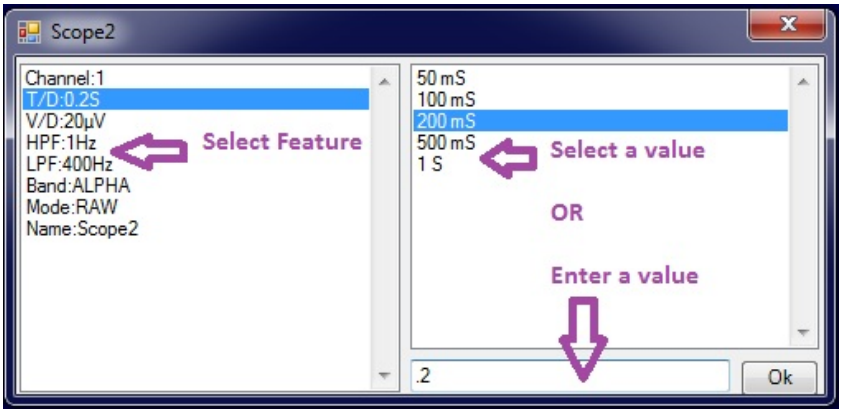

Figure 6.8 Scope Setting Table, Select Time Division

☞ The values you see in horizontal scale of the scope are not the current time of the data, they are just Time Divisions. If you want to see the current time, look at the **Time** button on the **PlayBox** panel (See sec. 5.7).

- Click on one of the items on the right side of the table or type your own value(You should enter a value on *volt* scale. e.g. .003 for $3mv$.).
- The horizontal scale is changed. Each of the grid box in the scope is now equal to the value you set as **T/D**.

6.4.4 Select Vertical Scale

- Right click on the panel to open the setting table.
- Click on the item **V/D** on the left side of the table to change the Vertical scale.
- Click on one of the items on the right side of the table or type your own value (You should enter a value on *volt* scale. e.g. .003 for $3mv$.)

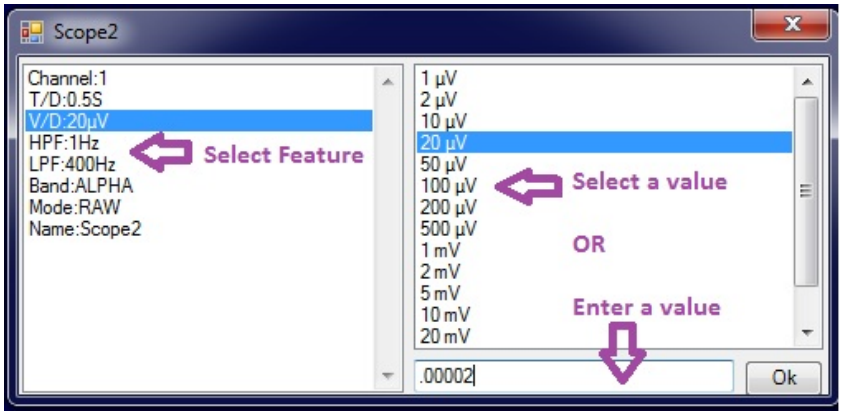

Figure 6.9 Scope setting table, select Volt/Division

- The vertical scale is instantly changed. You can try different scales and select the best. Each of the grid box in the scope is now equal to the value you set as **V/D**.
- Click **OK**.

6.4.5 Implement Filter to Data

- Right click on the panel to open the setting table.
- Click on the item **LPF** on the left side of the table to implement low pass filter or **HPF** for high pass filter.
- Click on one of the items on the right side of the table or type your own value to determine cut of frequency of the filter.

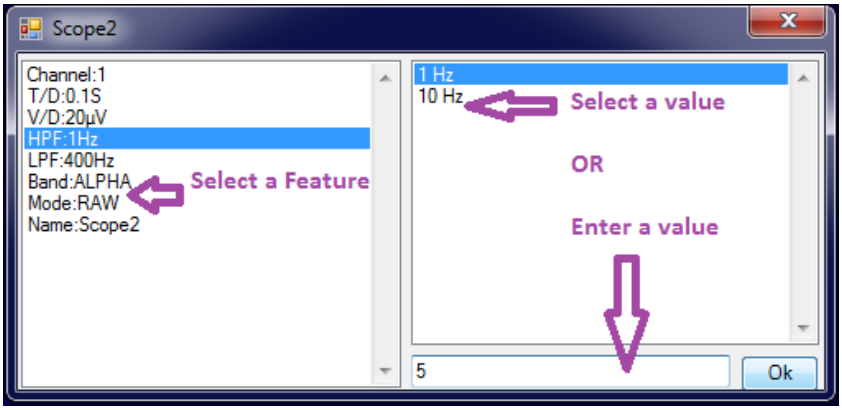

Figure 6.10 Scope setting table, select cut of frequency of the filter

- The displayed data is filtered while the original data is the same.

Chapter 7

FFT

7.1 FFT at a Glance

In FFT panel, you can see the square of the instantaneous FFT power of your desired band.

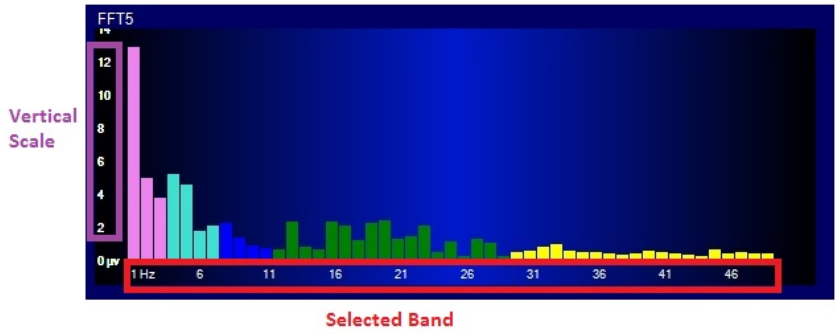

Figure 7.1 FFT

7.2 FFT Setting Table

In the FFT setting table, you can see some items to change:

- **Channel**: You can select the channel you want to see its frequency content.
- **Band**: You may want to see the FFT of specific EEG band or any other frequency band that you want. You can choose one of the predefined EEG bands on the setting table or enter a band in the forms of $StartBand - StopBand$.
- **V/D**: The amplitude of the FFT signal may be in different scales such as μv, mv or v. The signal maybe too small or too large to be seen in the FFT. Therefore, you need to change the vertical scale (Volt/Division) using **V/D**.

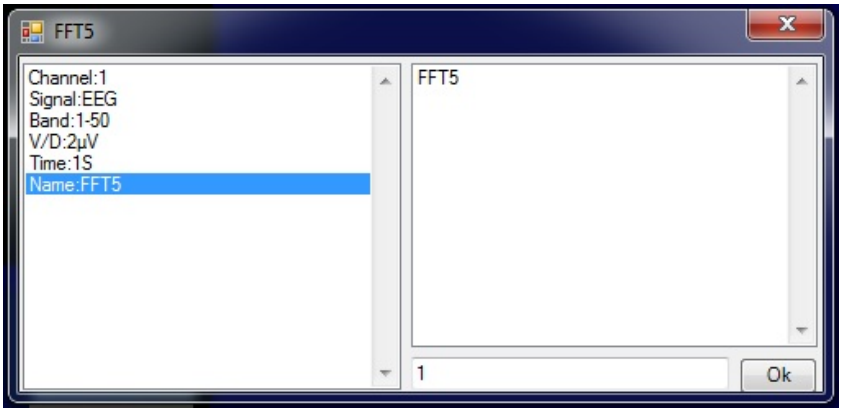

Figure 7.2 FFT Setting

- **Time**: You can change the window size of the FFT calculation window.
- **Name**: You can change the name of the panel.

Extra Items

You can see some other options during **EditMode** (When you have pressed the **E** key on the keyboard and you can see **Edit toolbar** in the screen) including:

- **H**: You can change the height of the panel.
- **W**: You can change the height of the panel.
- **X**: You can change the position in x-axis.
- **Y**: You can change the position in y-axis.

Figure 7.3 Edit Toolbar

7.3 Make a New FFT Panel

- Run the **eWave Probe** to open the main menu.
- Click on **File** > **Open Protocol** to open a protocol or on **File** > **New Protocol** to create a new protocol. An editable page is opened.
- If the **Edit Toolbar** does not present in the page, press **E** key on the keyboard to see it. The **Edit Toolbar** (Fig. 7.3) is appeared in the left side of the page.
- Click on the item named **FFT**. This item is highlighted.
- Click on the position of the page that you want to place the panel. The FFT panel is now made with default size. You can change the size and position to the values you want.

7.3.1 Changing Size and Position

- If the **Edit Toolbar** does not present in the page, press **E** key on the keyboard to see it. Now, you are in **Edit Mode** and you can modify the panel.
- Click on the borders of the panel and drag the mouse to resize it.
- Click on the center of the panel and drag the mouse to move it.

☞ You can edit panel only when you are in **Edit Mode** .i.e. you have pressed the **E** key on keyboard and you can see **Edit Toolbar** in the page.

An Alternative Way

If you want to specify the exact value of size and position do the following:

- If the **Edit Toolbar** does not present in the page, press **E** key on the keyboard to see it. Now, you are in **Edit Mode** and you can modify the panel.
- Right click on the panel to open the setting table.
- Click on **H**, to change height, and type the value you want.

☞ You can see these extra features in the setting table only when you are in **Edit Mode**.

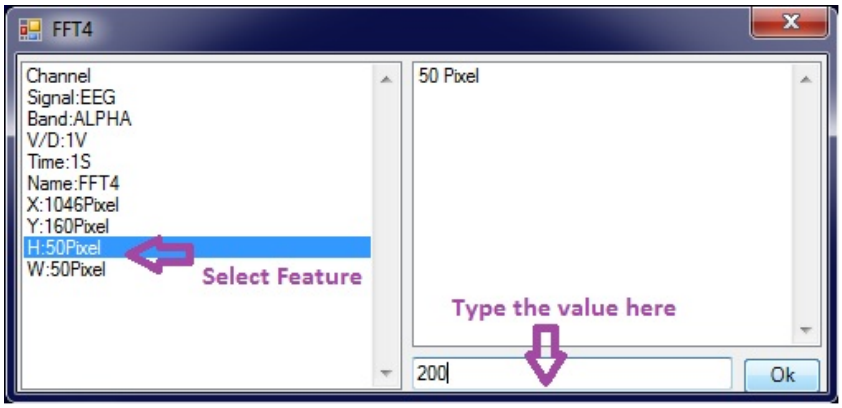

Figure 7.4 FFT setting table, change size and position

- Click on **W**, to change width, and type the value you want.
- Click on **X**, to change the position in x-axis, and type the value you want.
- Click on **Y**, to change the position in y-axis, and type the value you want.

7.4 Select Display Setting

7.4.1 Select Channel to Display

- Right click on the panel to open the setting table.
- Click on the item **Channel** on the left side of the table to change the channel.

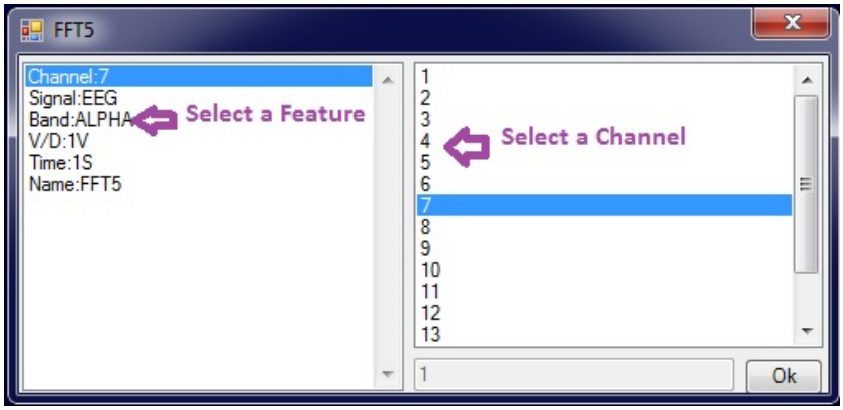

Figure 7.5 FFT setting table, change channel

- Click on one of the items on the right side of the table and select the channel you want to display.

7.4.2 Select Frequency Band

- Right click the panel to open the setting table.
- Click on the item **Band** on the left side of the table to change the frequency bands that you want to see in horizontal scale. The frequency range of some predefined Bands are shown in table . 7.1

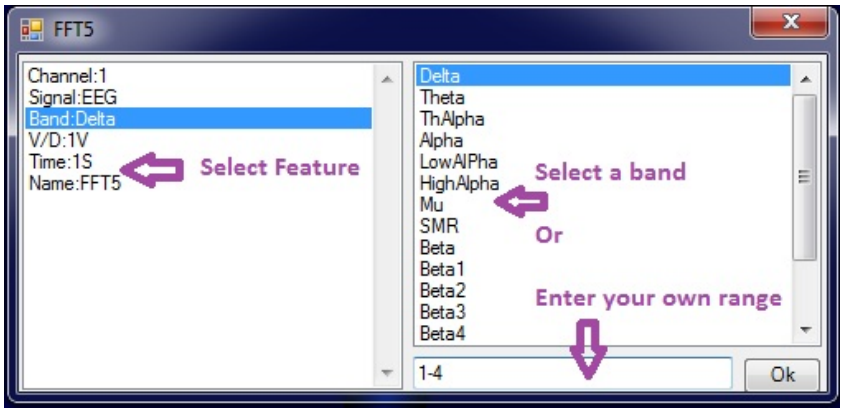

Figure 7.6 FFT setting table, select band

- Click on one of the predefined bands on the right side of the table or type your own frequency range(e.g. $1-50$).
- The number of frequency bin is changed to cover the range that you set as **Bands**.

Delta: $1-4Hz$

Theta: $4-8Hz$

Thalpha: $6-10Hz$

Alpha: $8-12Hz$

LowAlpha: $8-10Hz$

HighAlpha: $10-12Hz$

Mu: $8-13Hz$

SMR: $12-15Hz$

Beta: $12-35Hz$

Beta1: $15-18Hz$

Beta2: $18-22Hz$

Beta3: $22-26Hz$

Beta4: $26-30Hz$

Beta5: $30-35Hz$

Gama: $35-100Hz$

LowArtifact: $43-59Hz$

HighArtifact: $1-2Hz$

Table 7.1 The Range of Frequency Bands

7.4.3 Select Vertical Scale

- Right click on the panel to open the setting table.
- Click on the item **V/D** on the left side of the table to change the Vertical scale.
- Click on one of the items on the right side of the table or type your own value (You should enter a value on *volt* scale. e.g. .003 for $3mv$.)

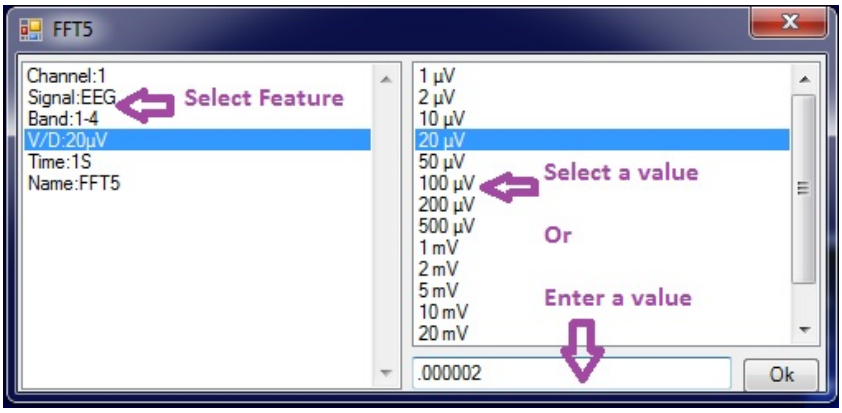

Figure 7.7 FFT setting table, change vertical scale

- The vertical scale is instantly changed. You can try different scales and select the best. Each of the grid box in the scope is now equal to the value you set.

7.4.4 Select FFT Calculation Window Size

The FFT value is calculated online but it considers previous samples up to a specific window length. Selecting FFT window size, you can determine if you want to consider previous samples of one, two, four or eight seconds. If your data has sharp changes and you want to track changes in every second, then choose one second for FFT window size. If not, you can choose larger values.

- Right click on the panel to open the setting table.
- Click on the item **Time** on the left side of the table to change FFT window size.

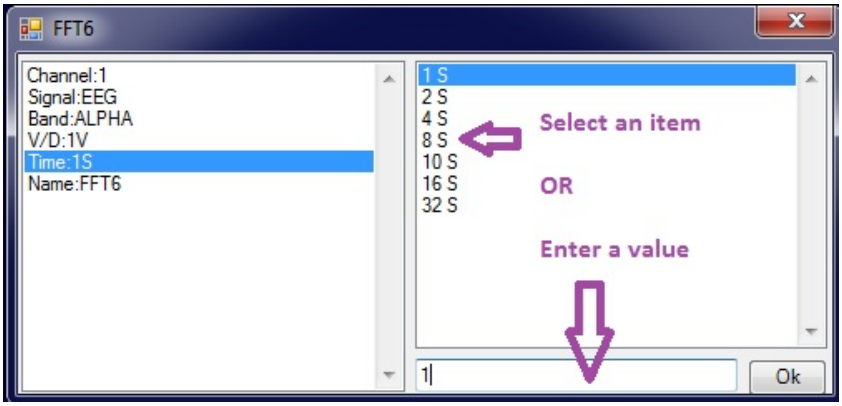

Figure 7.8 FFT setting table, change FFT window size

- Click on one of the items on the right side of the table or enter a value to select the window size.

Chapter 8

Val

8.1 Val at a Glance

This panel displays the square of the FFT power of the band that you have selected. You can select the band and the channel that you want to see the corresponding value.

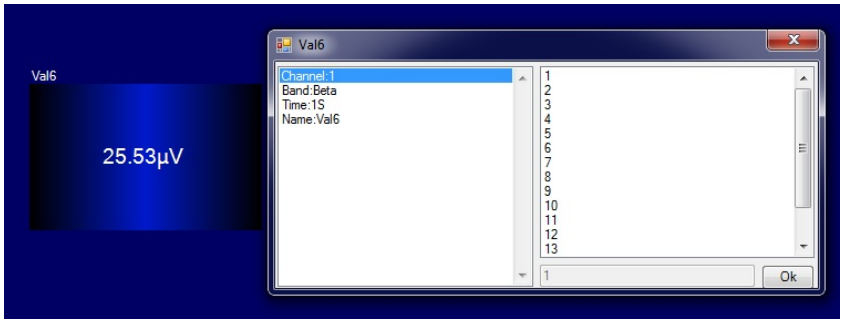

Figure 8.1 Val

8.2 Val Setting Table Properties

In the Val panel, The square of the FFT power of the band that you have selected is calculated. In the Val setting table, you can see some items to change:

- **Channel**: You can see the output Val of only one channel at a time in each Val panel. Here, you can select the channel you want to see.
- **Band**: You may want to see the FFT of specific EEG band or any other frequency band that you want. You can choose one or multiple predefined EEG bands on the setting table or enter a band in the forms of $StartBand-StopBand$.
- **Time**: You can change the window size of the FFT calculation method.
- **Name**: You can change the name of the panel using this item.

Extra Items

You can see some other options during **EditMode** (When you have pressed the **E** key on the keyboard and you can see **Edit toolbar** in the screen) including:

- **H**: You can change the height of the panel.
- **W**: You can change the height of the panel.
- **X**: You can change the position in x-axis.
- **Y**: You can change the position in y-axis.

8.3 Make a New Val Panel

Figure 8.2 Edit Toolbar

☞ You can edit panel only when you are in **Edit Mode** .i.e. you have pressed the **E** key on keyboard and you can see **Edit Toolbar** in the page.

- Run the **eWave Probe** to open the main menu.
- Click on **File** > **Open Protocol** to open a protocol or on **File** > **New Protocol** to create a new protocol. An editable page is opened.
- If the **Edit Toolbar** does not present in the page, press **E** key on the keyboard to see it. The **Edit Toolbar** (Fig. 8.2) is appeared in the left side of the page.
- Click on the item named **Val**. This item is highlighted.
- Click on the position of the page that you want to place the panel. The Val panel is now made with default size. You can change the size and position to the values you want.

8.3.1 Changing Size and Position

- If the **Edit Toolbar** does not present in the page, press **E** key on the keyboard to see it. Now, you are in **Edit Mode** and you can modify the panel.
- Click on the borders of the panel and drag the mouse to resize it.
- Click on the center of the panel and drag the mouse to move it.

An Alternative Way

If you want to specify the exact value of size and position do the following:

- If the **Edit Toolbar** does not present in the page, press **E** key on the keyboard to see it. Now, you are in **Edit Mode** and you can modify the panel.
- Right click on the panel to open the setting table.

☞ You can see these extra features in the setting table only when you are in **Edit Mode**.

- Click on the item **H**, to change height, and type the value you want.

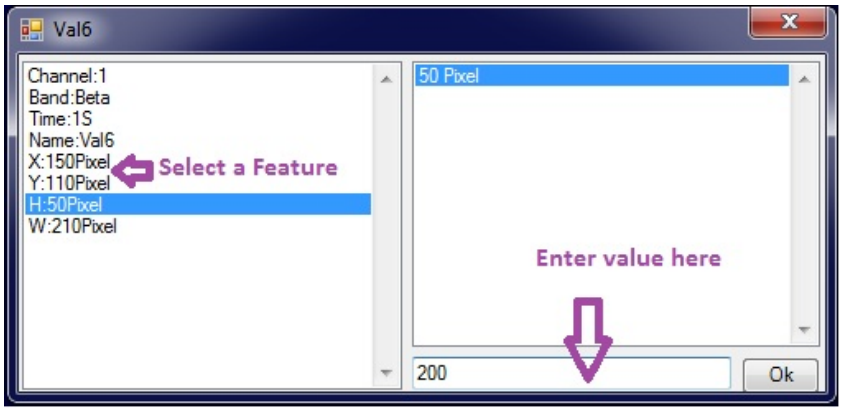

Figure 8.3 Val setting table, change size and position

- Click on the item **W**, to change Width, and type the value you want.
- Click on the item **X**, to change the position in x-axis, and type the value you want.
- Click on the item **Y**, to change the position in y-axis, and type the value you want.

8.4 Select Display Setting

8.4.1 Select Channel to Calculate Val

- Right click on the panel to open the setting table.
- Click on the item **Channel** on the left side of the table to change the channel.

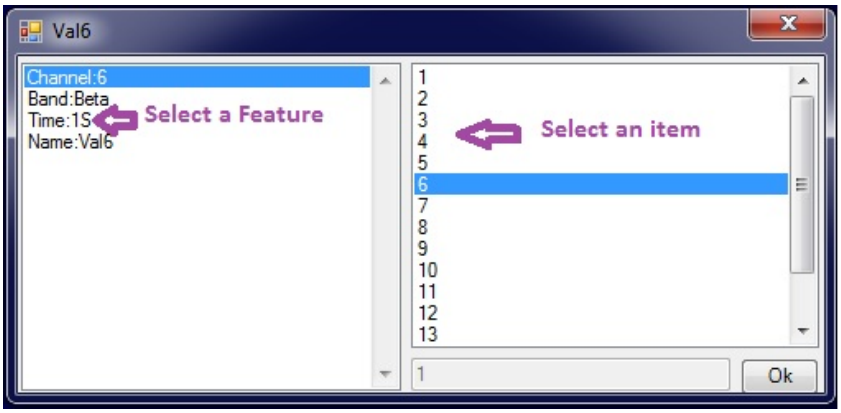

Figure 8.4 Val setting table, select channel

- Click on one of the items on the right side of the table and select the channel you want to display.

8.4.2 Select Frequency Band

- Right click the panel to open the setting table.
- Click on the item **Band** on the left side of the table to change the frequency bands that you want to see in horizontal scale. The frequency range of some predefined are shown in table. 8.1

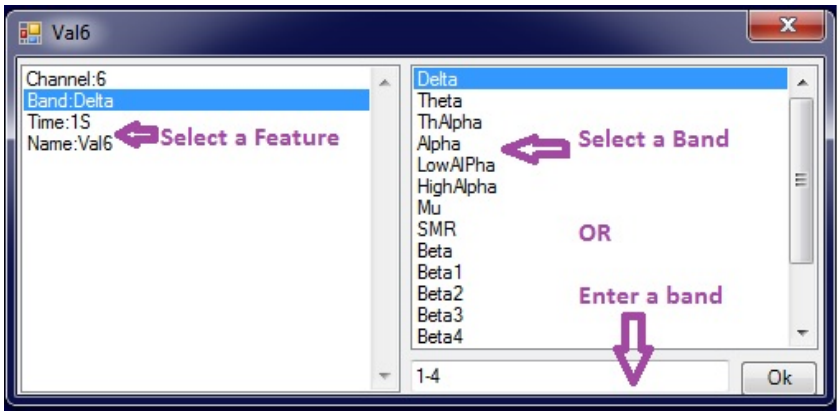

Figure 8.5 Val setting table, select frequency band

- Click on one of the predefined bands on the right side of the table or type your own frequency range(e.g. $1-50$).
- The number of frequency bins is changed to cover the range that you set as **Bands**.

Delta: $1-4Hz$

Theta: $4-8Hz$

Thalpha: $6-10Hz$

Alpha: $8-12Hz$

LowAlpha: $8-10Hz$

HighAlpha: $10-12Hz$

Mu: $8-13Hz$

SMR: $12-15Hz$

Beta: $12-35Hz$

Beta1: $15-18Hz$

Beta2: $18-22Hz$

Beta3: $22-26Hz$

Beta4: $26-30Hz$

Beta5: $30-35Hz$

Gama: $35-100Hz$

LowArtifact: $43-59Hz$

HighArtifact: $1-2Hz$

Table 8.1 The Range of Frequency Bands

8.4.3 Select FFT Calculation Window Size

The FFT value is calculated online but it considers previous samples up to a specific window length. Selecting FFT window size, you can determine if you want to consider previous samples of one, two, four or eight seconds. If your data has sharp changes and you want to track changes in every second, then choose one second for FFT window size. If not, you can choose larger values.

- Right click on the panel to open the setting table.
- Click on the item **Time** on the left side of the table to change FFT window size.

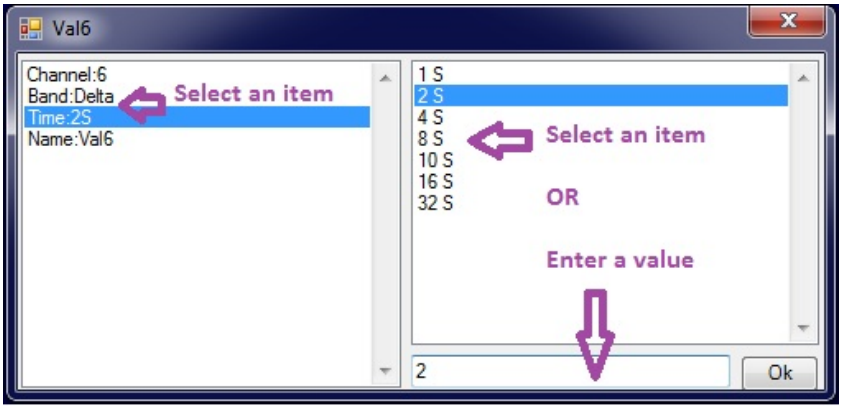

Figure 8.6 Val setting table, change FFT window size

- Click on one of the items on the right side of the table or enter a value to select the window size.

Chapter 9

Bar

9.1 Bar at a Glance

This panel calculates the square of the FFT power of the band that you have selected and displays it using a colored bar. It also shows weather this value is beyond or less than your desired threshold and considers it as a logic for the Game panel. This logic is used in Game panel as a command or rule that determines how the game should play. You can see both the value of the FFT power and the value of the logic in the Bar panel. The FFT power is displayed in lower part of the bar and the logic is displayed in color form. It is green/red for upper than threshold and red/green for lower than threshold in Non Inverted/Inverted mode.

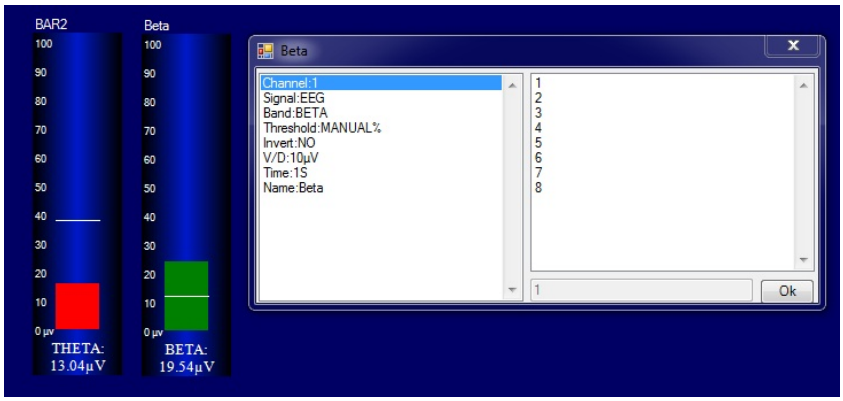

Figure 9.1 Bar

9.2 Bar Setting Table Properties

In the Bar setting table you can see some items to change:

- **Channel**: You can see the output bar of only one channel at a time in each Bar panel. Here, you can select the channel you want to see.

- **Band**: You may want to see the FFT of specific EEG band or any other frequency band that you want. You can choose one or multiple predefined EEG bands on the setting table or enter a band in the forms of $StartBand-StopBand$.
- **Threshold**: You need to select a threshold for each bar to determine whether the FFT value of the selected band is less or more than the desired value. This threshold play role in other panels such as Game. It determines whether the video or game is played or not, which animation should be displayed or with which size the movie should be played. You can select this value using the item **Threshold**.
- **Invert**: You need to determine whether the objective of each bar is decreasing or increasing the frequency band. In other word, you need to specify for the software that you want to give reward for increasing or decreasing the FFT power of this band
- **V/D**: The amplitude of the signal may be in different scales such as μv, mv or v. As a result, signal maybe too small or too large to be seen in the scope. Therefore, you need to change the vertical scale (Volt/Division) using **V/D**. Note that each value you select is equal to one of the grids in vertical axis.
- **Time**: You can change the window size of the FFT calculation method.
- **Name**: You can change the name of the panel using this item.

Extra Items

You can see some other options during **EditMode** (When you have pressed the **E** key on the keyboard and you can see **Edit toolbar** in the screen) including:

- **H**: You can change the height of the panel.
- **W**: You can change the height of the panel.
- **X**: You can change the position in x-axis.
- **Y**: You can change the position in y-axis.

9.3 Make a New Bar Panel

- Run the **eWave Probe** to open the main menu.
- Click on **File** > **Open Protocol** to open a protocol or on **File** > **New Protocol** to create a new protocol. An editable page is opened.

- If the **Edit Toolbar** does not present in the page, press **E** key on the keyboard to see it. The **Edit Toolbar** (Fig. 9.2) is appeared in the left side of the page.

- Click on the item named **Bar**. This item is highlighted.
- Click on the position of the page that you want to place the panel. The Bar panel is now made with default size. You can change the size and position to the values you want.

Figure 9.2 Edit Toolbar

9.3.1 Changing Size and Position

- If the **Edit Toolbar** does not present in the page, press **E** key on the keyboard to see it. Now, you are in **Edit Mode** and you can modify the panel.
- Click on the borders of the panel and drag the mouse to resize it.
- Click on the center of the panel and drag the mouse to move it.

☞ You can edit panel only when you are in **Edit Mode** .i.e. you have pressed the **E** key on keyboard and you can see **Edit Toolbar** in the page.

☞ You can see these extra features in the setting table only when you are in **Edit Mode**.

An Alternative Way

If you want to specify the exact value of size and position do the following:

- If the **Edit Toolbar** does not present in the page, press **E** key on the keyboard to see it. Now, you are in **Edit Mode** and you can modify the panel.
- Right click on the panel to open the setting table.
- Click on the item **H**, to change height, and type the value you want.

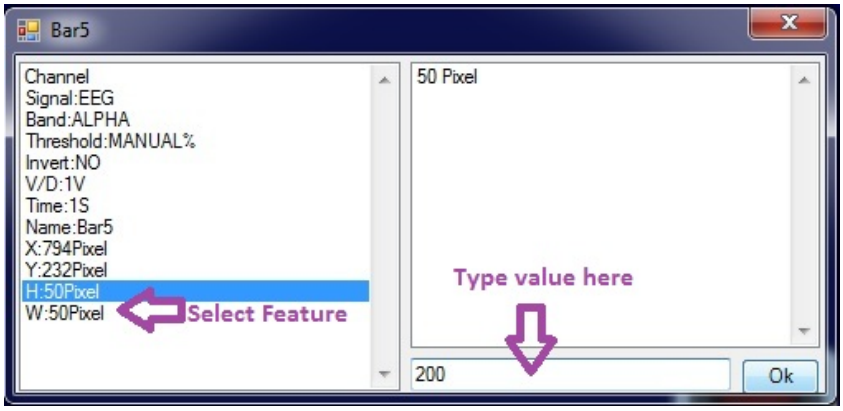

Figure 9.3 Bar setting table, change size and position

- Click on the item **W**, to change Width, and type the value you want.
- Click on the item **X**, to change the position in x-axis, and type the value you want.
- Click on the item **Y**, to change the position in y-axis, and type the value you want.

9.4 Select Display Setting

9.4.1 Select Channel to Calculate Bar

- Right click on the panel to open the setting table.
- Click on the item **Channel** on the left side of the table to change the channel.

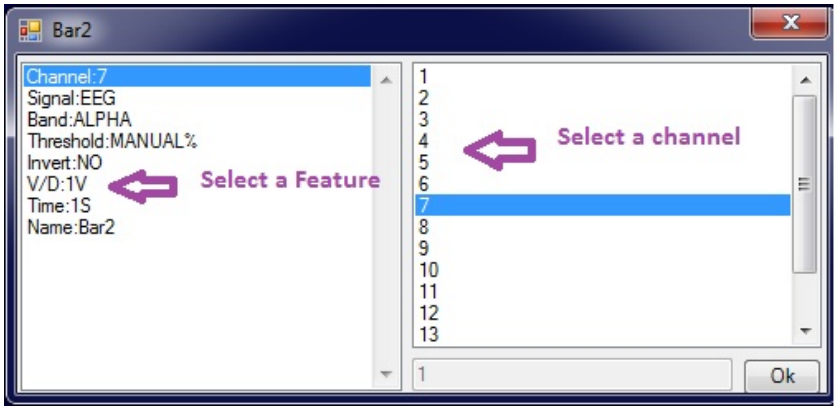

Figure 9.4 Bar setting table, select channel

- Click on one of the items on the right side of the table and select the channel you want to display.

9.4.2 Select Frequency Band

- Right click the panel to open the setting table.
- Click on the item **Band** on the left side of the table to change the frequency bands that you want to see in horizontal scale. The frequency range of some predefined are shown in table. 9.1

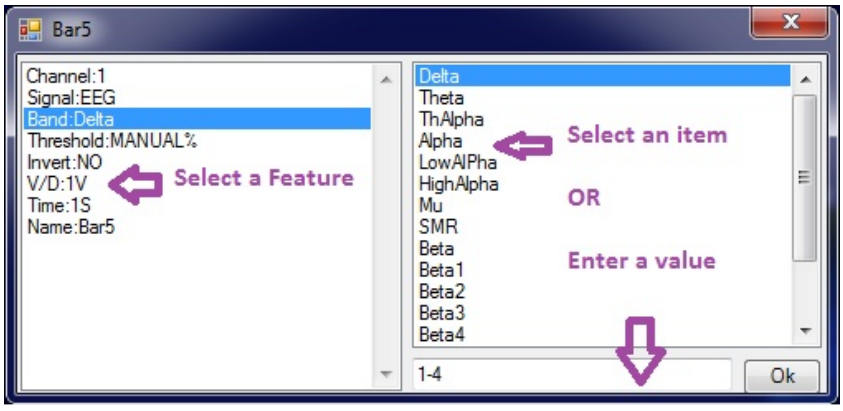

Figure 9.5 Bar setting table, select frequency band

Delta: $1-4Hz$

Theta: $4-8Hz$

Thalpha: $6-10Hz$

Alpha: $8-12Hz$

LowAlpha: $8-10Hz$

HighAlpha: $10-12Hz$

Mu: $8-13Hz$

SMR: $12-15Hz$

Beta: $12-35Hz$

Beta1: $15-18Hz$

Beta2: $18-22Hz$

Beta3: $22-26Hz$

Beta4: $26-30Hz$

Beta5: $30-35Hz$

Gama: $35-100Hz$

LowArtifact: $43-59Hz$

HighArtifact: $1-2Hz$

Table 9.1 The Range of Frequency Bands

- Click on one of the predefined bands on the right side of the table or type your own frequency range(e.g. $1-50$).
- The number of frequency bins is changed to cover the range that you set as **Bands**.

9.4.3 Select Threshold Value

You need to select a threshold for each bar to determine whether the FFT value of the selected band is less or more than the desired value. This threshold play role in other panels such as Game, it determines whether the video or game is played or not, which animation should be displayed or with which size the movie should be played. The value of the threshold is important in training a client's brain waves and should be specific to each individual. You have two ways to determine a threshold : **Manually** or **Automatically**.

Manually

In this case, you yourself can select the threshold according to your instantaneous observation of the client's performance.

- Right click on the panel to open the setting table.
- Click on the item **Threshold** on the left side of the table.

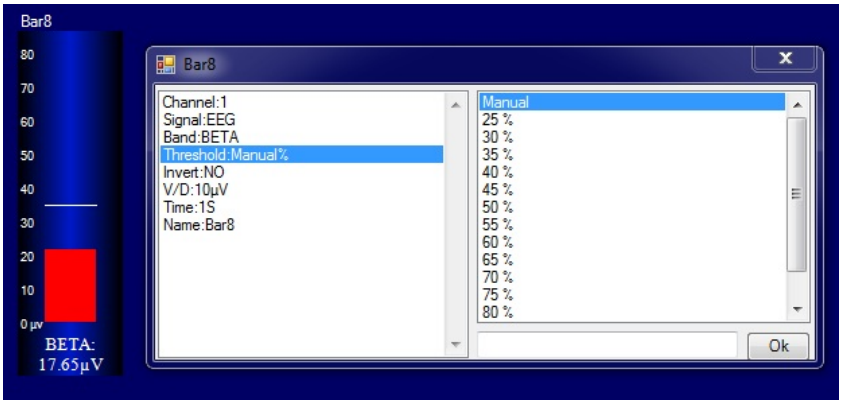

Figure 9.6 Bar setting table, Select threshold value

- Click on the item **manual** on the right side of the table.
- From this time on you can change the value of threshold. Left click on the position you want. A white line moves to the new position and shows the value of the threshold.

Automatically

The software can automatically select the threshold according to the percentage that you determine. For example, selecting %60, the software should give reward in 60 percent of the cases. In this case, the value of threshold is not constant . It changes during the time so that in overall the client receives positive feedback in 60 percent of the time.

- Right click on the panel to open the setting table.
- Click on the item **Threshold** on the left side of the table.

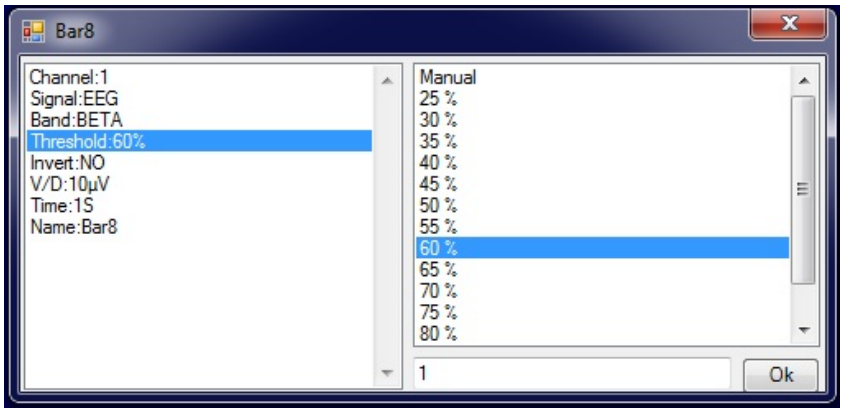

Figure 9.7 Bar setting table, Select threshold value

- Click on one of the percentages on the right side of the table or enter you own value.
- Click on **Ok**.

9.4.4 Select the Type of the Bar, Inverted or Non Inverted

In neurofeedback therapy, therapist may work on excessive fast or slow brainwaves to train them to behave in normal way. Hence, you may need to increase some brainwaves while decreasing some other brainwaves. In this software, the fact that the objective for each band in each bar is decreasing or increasing is determined by **Inverted** or **Non Inverted** terms respectively.

Inverted and Non Inverted Terms

- The term **Inverted** means that you expect the client to **decrease** undesired brainwaves hence the more he **reduces** that band the more he is eligible for reward.

- The term **Non Inverted** means that you expect the client to **increase** desired brainwaves hence the more he **increases** that band the more he is eligible for reward.

Figure 9.8 Example of Inverted and Non Inverted Bars

To determine the type of the bar do the following:

- Right click on the panel to open the setting table.
- Click on the item **Invert** on the left side of the table.

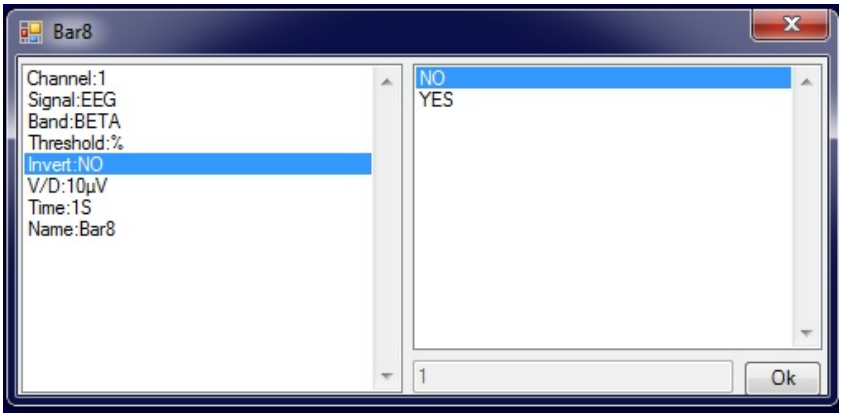

Figure 9.9 Bar setting table, Select the type of the Bar, inverted or not

- Click on **YES** for **Inverted** or **NO** for **Non Inverted** type.
- Click on **Ok**.

9.4.5 Select Vertical Scale

- Right click on the panel to open the setting table.
- Click on the item **V/D** on the left side of the table to change the Vertical scale.
- Click on one of the items on the right side of the table or type your own value (You should enter a value on *volt* scale. e.g. .003 for $3mv$.)

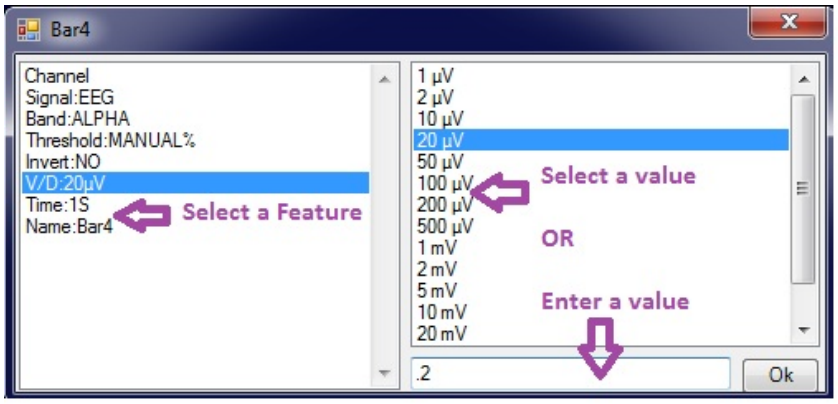

Figure 9.10 Bar setting table, change Volt/Division (Vertical Scale)

- The vertical scale is instantly changed. You can see the data and select the best you want. Each of the grid box in the scope is now equal to the value you set as **V/D**.

9.4.6 Select FFT Calculation Window Size

The FFT value is calculated online but it considers previous samples up to a specific window length. Selecting FFT window size, you can determine if you want to consider previous samples of one, two, four or eight seconds. If your data has sharp changes and you want to track changes in every second, then choose one second for FFT window size. If not, you can choose larger values.

- Right click on the panel to open the setting table.
- Click on the item **Time** on the left side of the table to change FFT window size.

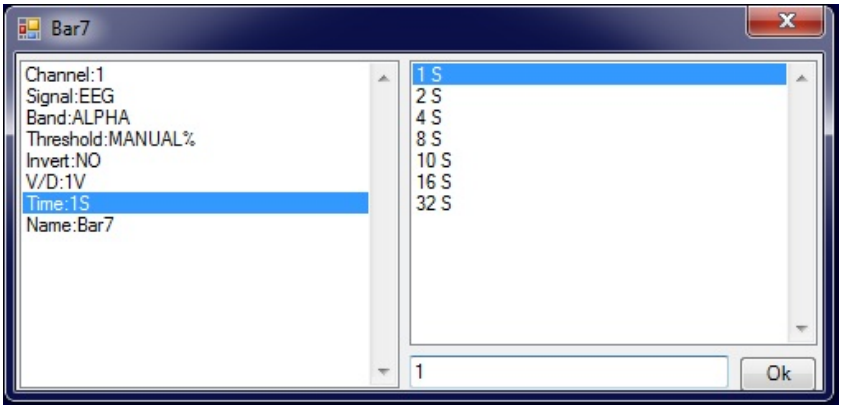

Figure 9.11 Bar setting table, change FFT window size

- Click on one of the items on the right side of the table or enter a value to select the window size.

Chapter 10

Light

10.1 Light at a Glance

This panel calculates the square of the FFT power of the band that you have selected and compares it with two thresholds. If the value is more than both thresholds the light shows green color. If it is less than both thresholds the color is red and if it is in the middle, the color is orange.

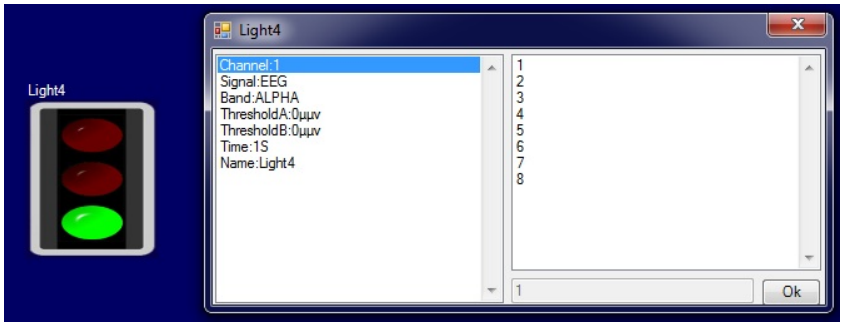

Figure 10.1 Light

10.2 Light Setting Table

In the Light setting table you can see some items to change:

- **Channel**: You can see the output Light of only one channel at a time in each Light panel. Here, you can select the channel you want to see.
- **Time**: You can change the window size of the FFT calculation method.
- **ThresholdA**: You can select the value of the first (lower) threshold using ThresholdA.
- **ThresholdB**: You can select the value of the second (higher) threshold using ThresholdB.

- **Band**: You can consider the FFT of specific EEG band or any other frequency band that you want using the item **Band**. You can choose one or multiple predefined EEG bands on the setting table or enter a band in the forms of $StartBand - StopBand$.
- **Name**: You can change the name of the panel using this item.

Extra Items

You can see some other options during **EditMode** (When you have pressed the **E** key on the keyboard and you can see **Edit toolbar** in the screen) including:

- **H**: You can change the height of the panel.
- **W**: You can change the height of the panel.
- **X**: You can change the position in x-axis.
- **Y**: You can change the position in y-axis.

10.3 Make a New Light Panel

Figure 10.2 Edit Toolbar

- Run the **eWave Probe** to open the main menu.
- Click on **File** > **Open Protocol** to open a protocol or on **File** > **New Protocol** to create a new protocol. An editable page is opened.
- If the **Edit Toolbar** does not present in the page, press **E** key on the keyboard to see it. The **Edit Toolbar** (Fig. 10.2) is appeared in the left side of the page.
- Click on the item named **Light**. This item is highlighted.
- Click on the position of the page that you want to place the panel. The Light panel is now made with default size. You can change the size and position to the values you want.

10.3.1 Changing Size and Position

☞ You can edit panel only when you are in **Edit Mode** .i.e. you have pressed the **E** key on keyboard and you can see **Edit Toolbar** in the page.

- If the **Edit Toolbar** does not present in the page, press **E** key on the keyboard to see it. Now, you are in **Edit Mode** and you can modify the panel.
- Click on the borders of the panel and drag the mouse to resize it.
- Click on the center of the panel and drag the mouse to move it.

An Alternative Way

☞ You can see these extra features in the setting table only when you are in **Edit Mode**.

If you want to specify the exact value of size and position do the following:

- If the **Edit Toolbar** does not present in the page, press **E** key on the keyboard to see it. Now, you are in **Edit Mode** and you can modify the panel.
- Right click on the panel to open the setting table.
- Click on the item **H**, to change height, and type the value you want.

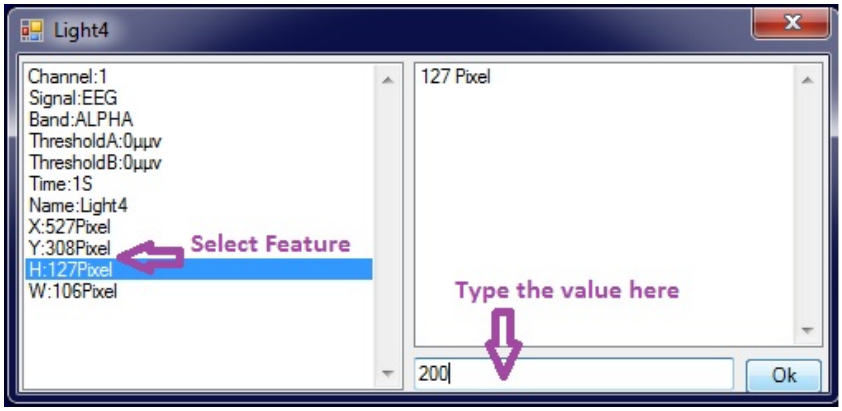

Figure 10.3 Light setting table, change size and position

- Click on the item **W**, to change Width, and type the value you want.
- Click on the item **X**, to change the position in x-axis, and type the value you want.
- Click on the item **Y**, to change the position in y-axis, and type the value you want.

10.4 Select Display Setting

10.4.1 Select Channel

- Right click on the panel to open the setting table.
- Click on the item **Channel** on the left side of the table to change the channel.

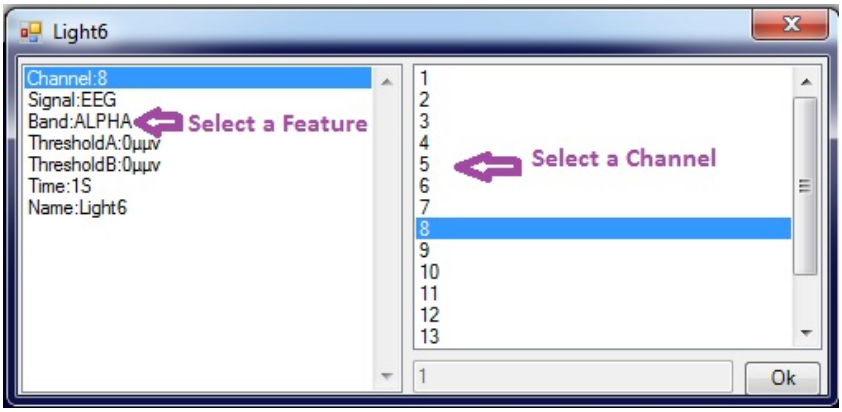

Figure 10.4 Light setting table, select channel

- Click on one of the items on the right side of the table and select the channel you want to display.

10.4.2 Select Frequency Band

- Right click the panel to open the setting table.
- Click on the item **Band** on the left side of the table to change the frequency bands that you want to see in horizontal scale. The frequency range of some predefined are shown in table. 10.1

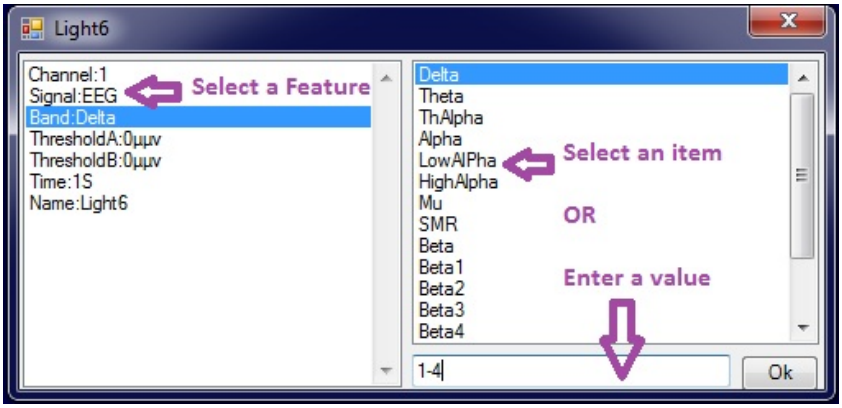

Figure 10.5 Light setting table, select frequency band

- Click on one of the predefined bands on the right side of the table or type your own frequency range(e.g. 1 – 50).
- The number of frequency bins is changed to cover the range that you set as **Bands**.

Delta: $1-4Hz$

Theta: $4-8Hz$

Thalpha: $6-10Hz$

Alpha: $8-12Hz$

LowAlpha: $8-10Hz$

HighAlpha: $10-12Hz$

Mu: $8-13Hz$

SMR: $12-15Hz$

Beta: $12-35Hz$

Beta1: $15-18Hz$

Beta2: $18-22Hz$

Beta3: $22-26Hz$

Beta4: $26-30Hz$

Beta5: $30-35Hz$

Gama: $35-100Hz$

LowArtifact: $43-59Hz$

HighArtifact: $1-2Hz$

Table 10.1 The Range of Frequency Bands

10.4.3 Select Thresholds Values

You need to select two thresholds for each Light panel to determine to compare the FFT value of the selected band with them. The value of the thresholds is important in training a client's brain waves and should be specific to each individual.

- Right click on the panel to open the setting table.
- Click on the item **ThresholdA/ThresholdB** on the left side of the table.

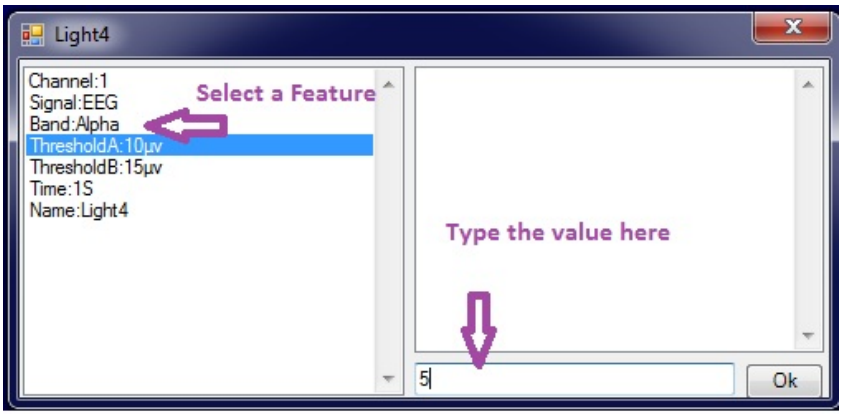

Figure 10.6 Light setting table, Select threshold value

- Type the value you want. Note that the value of ThresholdA should be less than ThresholdB.

10.4.4 Select FFT Calculation Window Size

The FFT value is calculated online but it considers previous samples up to a specific window length. Selecting FFT window size, you can determine if you want to consider previous samples of one, two, four or eight seconds. If your data has sharp changes and you want to track changes in every second, then choose one second for FFT window size. If not, you can choose larger values.

- Right click on the panel to open the setting table.
- Click on the item **Time** on the left side of the table to change FFT window size.

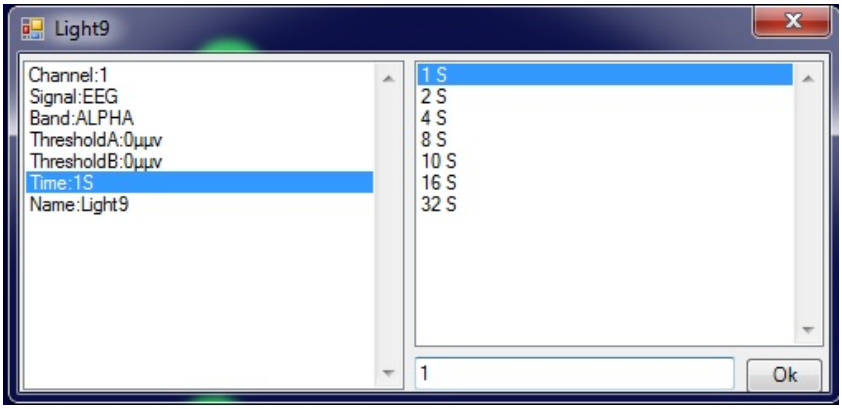

Figure 10.7 Light setting table, change FFT window size

- Click on one of the items on the right side of the table or enter a value to select the window size.

Chapter 11

Text

11.1 Text at a Glance

If you like to add some information as text to your protocol, you can use **Text** panel. You can also use this panel to show the result of the analyze panel (see Ch. 12).

Figure 11.1 Text

11.2 Text Setting Table

In the Text setting table, you can see some items to change:

- **Content**: Type what you like to write in your **Text** panel
- **Font**: You can select the font style and the size that you like from the font table.
- **Color**: You can select the text color that you like from the color table.

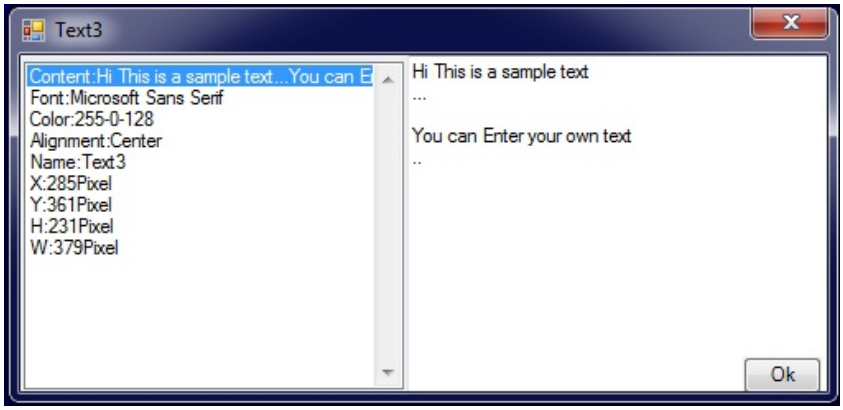

Figure 11.2 Text Setting

- **Alignment**: You can select the text to be aligned in the **Right**, **Left** or **Center** of the panel.
- **Name**: You can change the name of the panel.

Extra Items

You can see some other options during **EditMode** (When you have pressed the **E** key on the keyboard and you can see **Edit toolbar** in the screen) including:

- **H**: You can change the height of the panel.
- **W**: You can change the height of the panel.
- **X**: You can change the position in x-axis.
- **Y**: You can change the position in y-axis.

Figure 11.3 Edit Toolbar

11.3 Make a New Text Panel

- Run the **eWave Probe** to open the main menu.
- Click on **File** > **Open Protocol** to open a protocol or on **File** > **New Protocol** to create a new protocol. An editable page is opened.
- If the **Edit Toolbar** does not present in the page, press **E** key on the keyboard to see it. The **Edit Toolbar** (Fig. 11.3) is appeared in the left side of the page.
- Click on the item named **Text**. This item is highlighted.
- Click on the position of the page that you want to place the panel. The Text panel is now made with default size. You can change the size and position to the values you want.

11.3.1 Changing Size and Position

- If the **Edit Toolbar** does not present in the page, press **E** key on the keyboard to see it. Now, you are in **Edit Mode** and you can modify the panel.
- Click on the borders of the panel and drag the mouse to resize it.
- Click on the center of the panel and drag the mouse to move it.

☞ You can edit panel only when you are in **Edit Mode** .i.e. you have pressed the **E** key on keyboard and you can see **Edit Toolbar** in the page.

An Alternative Way

If you want to specify the exact value of size and position do the following:

- If the **Edit Toolbar** does not present in the page, press **E** key on the keyboard to see it. Now, you are in **Edit Mode** and you can modify the panel.
- Right click on the panel to open the setting table.
- Click on the item **H**, to change height, and type the value you want.

☞ You can see these extra features in the setting table only when you are in **Edit Mode**.

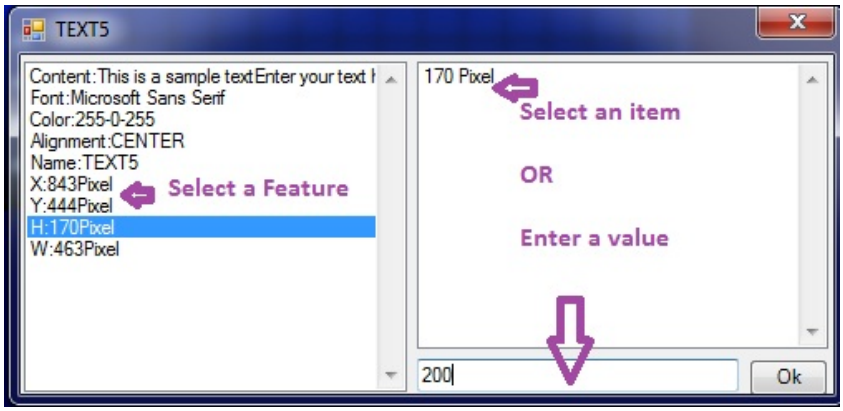

Figure 11.4 Analyze setting table, change Size and Position

- Click on the item **W**, to change width, and type the value you want.
- Click on the item **X**, to change the position in x-axis, and type the value you want.
- Click on the item **Y**, to change the position in y-axis, and type the value you want.

11.3.2 Change Text Properties

- If the **Edit Toolbar** does not present in the page, press **E** key on the keyboard to see it. Now, you are in **Edit Mode** and you can modify the panel.
- Right click on the text panel to open the setting table.

- Click on the item **Font** on the left side of the table and then click on the **Font Table** on the right side.

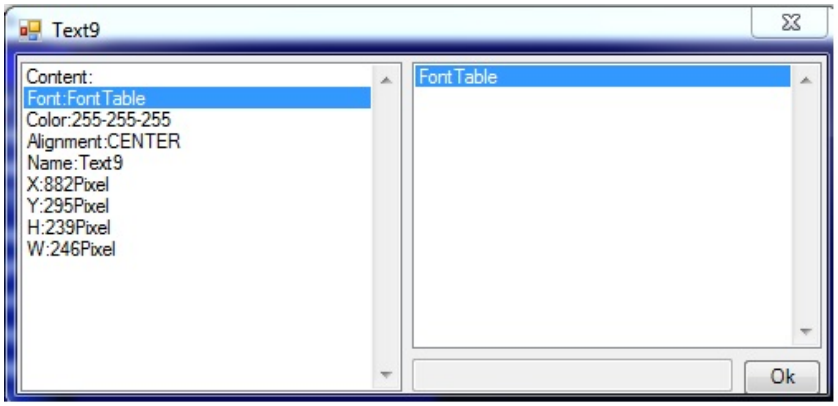

Figure 11.5 Analyze setting table, change the font

- Select the **Font**,**Font Style** and **Size** that you want and click on **OK**.

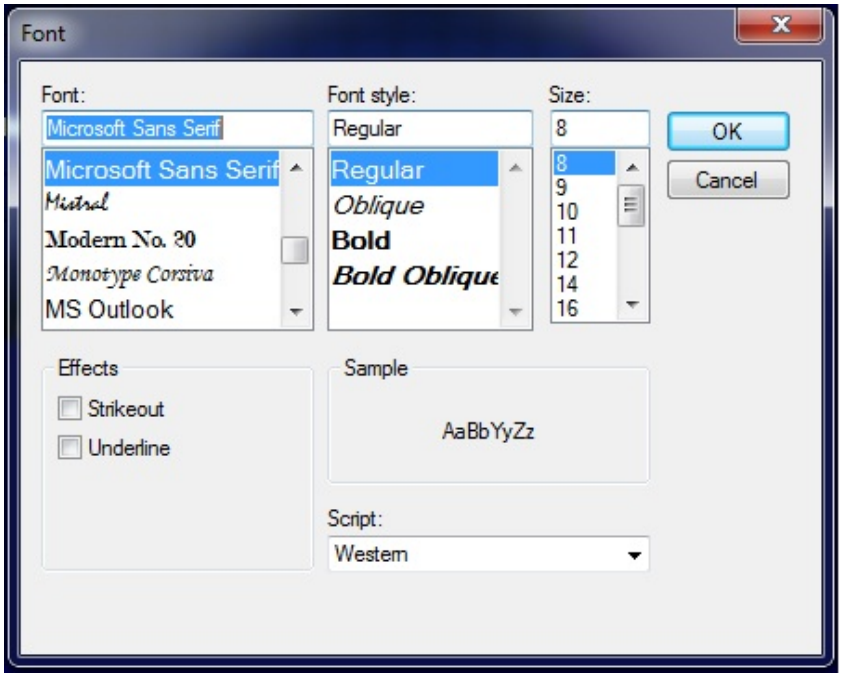

Figure 11.6 Font table

- Click on the item **Color** on the left side of the table and then click on the **Color Table** on the right side.

Figure 11.8 colortable

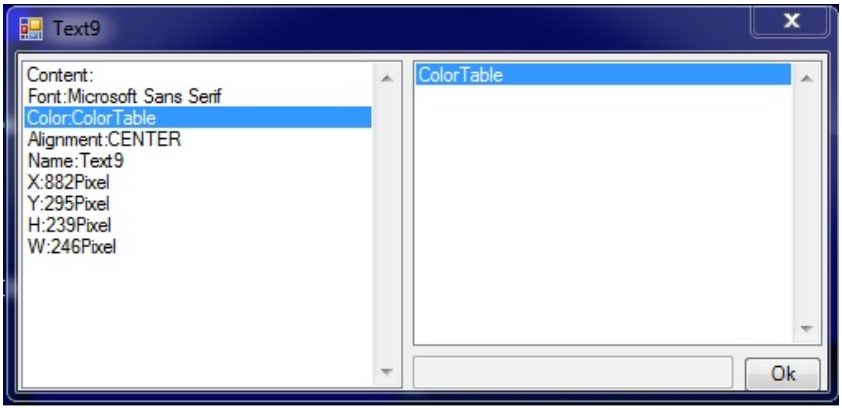

Figure 11.7 Analyze setting table, change the color

- Select the color that you want and click on **OK**.
- Click on the item **Alignment** on the left side of the table and then click on the **Right** or **Left** or **Center** to align the content in a way you like.

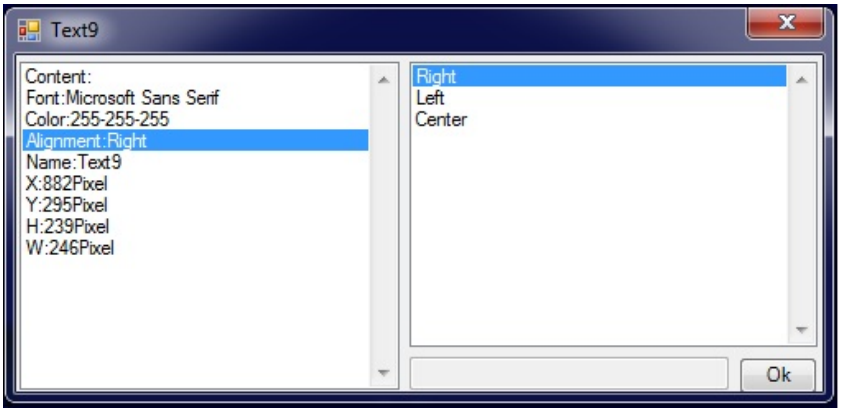

Figure 11.9 Analyze setting table, change the alignment

- Click on **Ok**. The content is displayed according to your desired properties.

Chapter 12

Analyze

After recording data you may need to see the whole data and analyze it. This panel provides you with a scope and a text panel to shows the signal and the FFT power of each of the bands that you want. You can select one or multiple bands and see the corresponding values in the text panel. By default, this panel shows the latest file that you have previously recorded. But you can change the analyze file and some other properties in the setting table.

Note that the text panel is another panel that you should create and introduce to the analyze panel

12.1 Analyze at a Glance

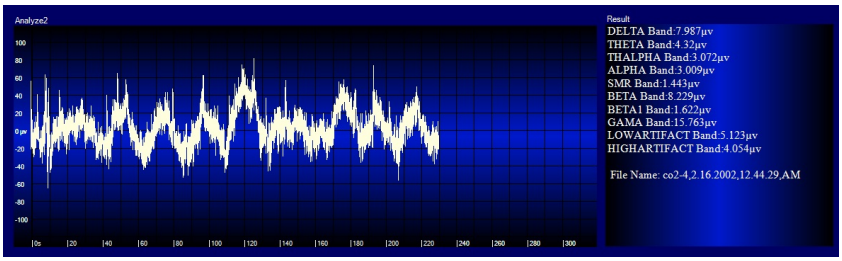

Figure 12.1 Analyze

12.2 Analyze Setting Table

In the Analyze setting table you can see some items to change:

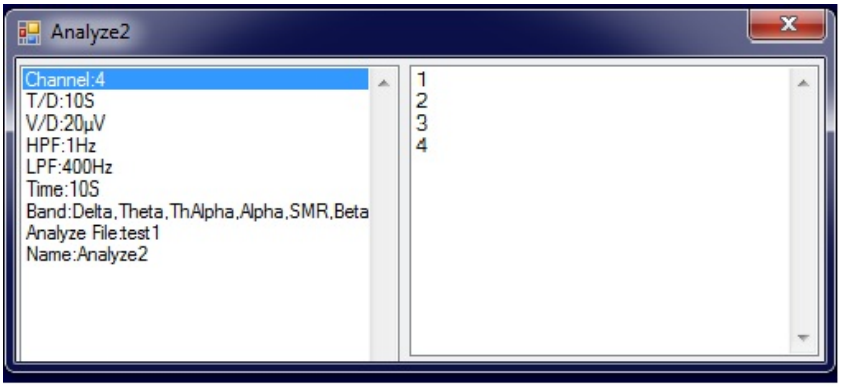

Figure 12.2 Analyze Setting

- **Channel**: You can see only one channel at a time in each Analyze panel. Here, you can select the channel you want to see.
- **V/D**: The amplitude of the signal may be in different scales such as μv, mv or v. As a result, signal maybe too small or too large to be seen in the scope. Therefore, you need to change the vertical scale (Volt/Division) using **V/D**. Note that each value you select is equal to one of the grids in vertical axis.
- **T/D**: You may need to see the details of the signal in μs scale or see the whole signal in s. So you can change the accuracy of the signal in time domain or the horizontal scale using **T/D**.
- **HPF**: You can implement a high pass filter to eliminate the high frequency signals or noises. You can select the cut of frequency of the high pass filter using item **HPF**.
- **LPF**: You can implement a low pass filter to eliminate the low frequency signals or noises. You can select the cut of frequency of the low pass filter using item **LPF**.
- **Time**: You can change the window size of the FFT calculation method.
- **Band**: In the result of the analyze panel, you see the square of the FFT power of the bands that you have selected using **Band** item. You may want to see the FFT of specific EEG bands or any other frequency band that you want. You have multi options here so you can choose one or multiple predefined EEG bands on the setting table or enter a band in the forms of $StartBand - StopBand$.
- **Analyze File**: By default, the analyze file is the latest signal that you have recently recorded. If you like to analyze another recorded data you can browse and select it using **Analyze File**.
- **Name**: You can change the name of the panel using this item.

Extra Items

You can see some other options during **EditMode** (When you have pressed the **E** key on the keyboard and you can see **Edit toolbar** in the screen) including:

- **Slave**: Using the item **Slave**, you can select a **Text** panel to the show the result of **Analyze**. Click on the **Slave** and then on the **Text** panel to show the result.
- **H**: You can change the height of the panel.
- **W**: You can change the height of the panel.
- **X**: You can change the position in x-axis.
- **Y**: You can change the position in y-axis.

12.3 Make a New Analyze Panel

- Run the **eWave Probe** to open the main menu.
- Click on **File** > **Open Protocol** to open a protocol or on **File** > **New Protocol** to create a new protocol. An editable page is opened.
- If the **Edit Toolbar** does not present in the page, press **E** key on the keyboard to see it. The **Edit Toolbar** (Fig. 12.3) is appeared in the left side of the page.
- Click on the item named **Analyze**. This item is highlighted.
- Click on the position of the page that you want to place the panel. The Analyze panel is now made with default size. You can change the size and position to the values you want.

Figure 12.3 Edit Toolbar

12.3.1 Changing Size and Position

- If the **Edit Toolbar** does not present in the page, press **E** key on the keyboard to see it. Now, you are in **Edit Mode** and you can modify the panel.
- Click on the borders of the panel and drag the mouse to resize it.
- Click on the center of the panel and drag the mouse to move it.

☞ You can edit panel only when you are in **Edit Mode** .i.e. you have pressed the **E** key on keyboard and you can see **Edit Toolbar** in the page.

An Alternative Way

If you want to specify the exact value of size and position do the following:

- If the **Edit Toolbar** does not present in the page, press **E** key on the keyboard to see it. Now, you are in **Edit Mode** and you can modify the panel.

☞ You can see these extra features in the setting table only when you are in **Edit Mode**.

- Right click on the panel to open the setting table.
- Click on the item **H**, to change height, and type the value you want.

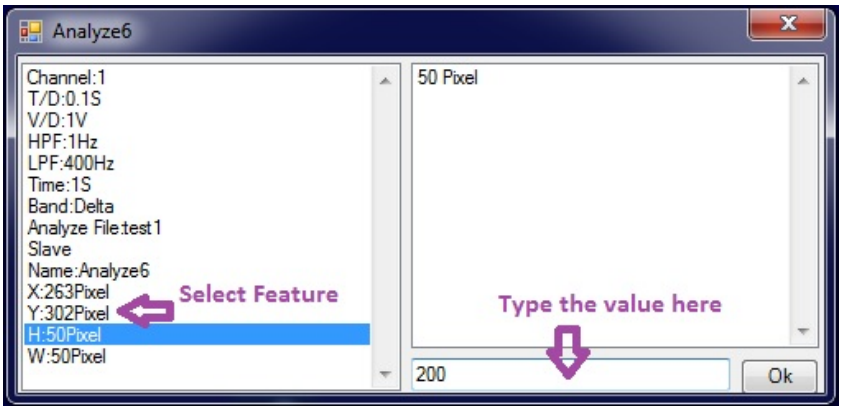

Figure 12.4 Analyze setting table, change Size and Position

- Click on the item **W**, to change width, and type the value you want.
- Click on the item **X**, to change the position in x-axis, and type the value you want.
- Click on the item **Y**, to change the position in y-axis, and type the value you want.

12.4 Select Display Setting

12.4.1 Select Data to Analyze

- Right click on the panel to open the setting table.
- Click on the item **Analyze File** on the left side of the table and select Browse on the right side to open a file for analyze.

Figure 12.5 Analyze setting table, select file

- Browse on the file you want and click on **Open**.

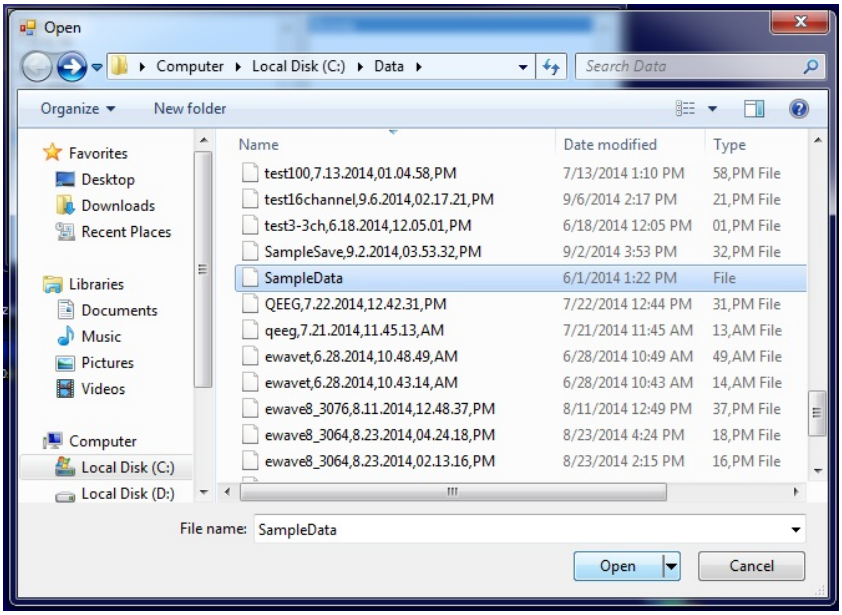

Figure 12.6 Open dialog box for analyze file

- Click on **Ok**. The data is displayed on the Analyze panel.
- If you have attached a text panel to the analyze panel, the result is shown in the text panel. If you have not, follow (Sec. 12.4.2) to show the result.

12.4.2 Select a Text to Show the Result

- Make a New Text Panel as discussed in section . 11.3 (or you may want to select an existed text panel).
- If the **Edit Toolbar** does not present in the page, press **E** key on the keyboard to see it. Now you are in **Edit Mode**.
- Right click on the panel to open the setting table.
- Click on the item **Slave** on the left side of the table and then click on the text panel that you want to show the result.

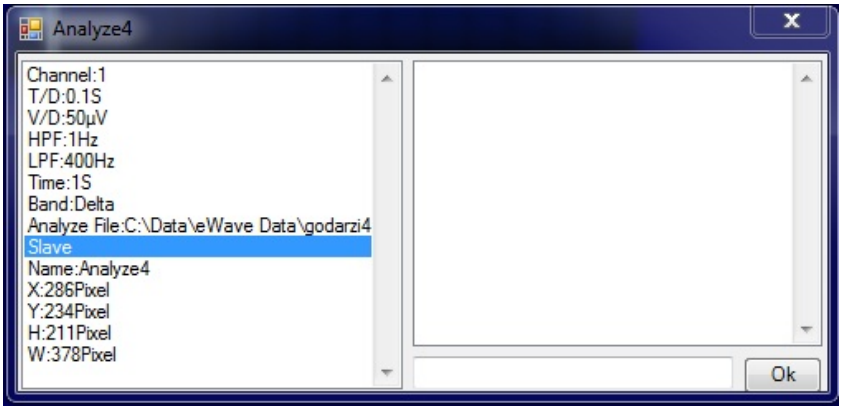

Figure 12.7 Analyze setting table, select a text panel to show the result

- Click on **Ok**. The result is displayed on the text panel.

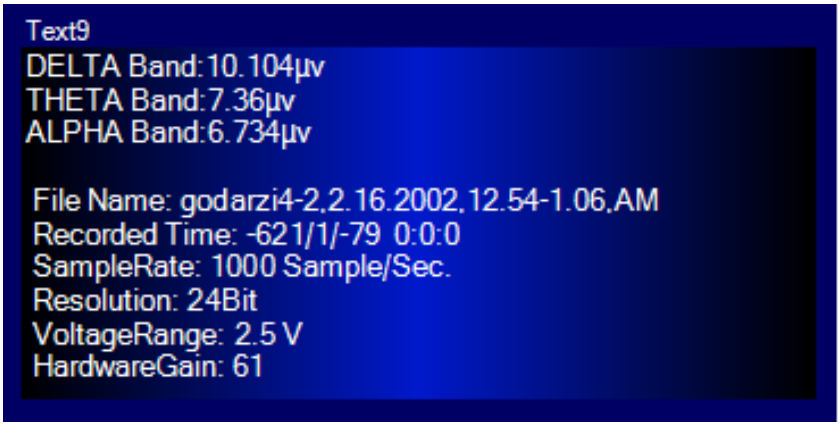

Figure 12.8 The result of the Analyze

Information to display on the text

In the text panel of the analyze you can see the following information:

- The FFT amplitude of each of the bands that you have selected.
- **File Name**: The name of the analyze file that you are working on.
- **Recorded File**: The recording time of the file.
- **Sample Rate**: The frequency sampling of the data.
- **Resolution**: The resolution is $24bit$.
- **Voltage Range**: The voltage range is $\pm$ 2.5.
- **Hardware Gain**: The Gain of amplifier is 61.

12.4.3 Change Text Properties

- If the **Edit Toolbar** does not present in the page, press **E** key on the keyboard to see it. Now, you are in **Edit Mode** and you can modify the panel.
- Right click on the text panel to open the setting table.
- Click on the item **Font** on the left side of the table and then click on the **Font Table** on the right side.

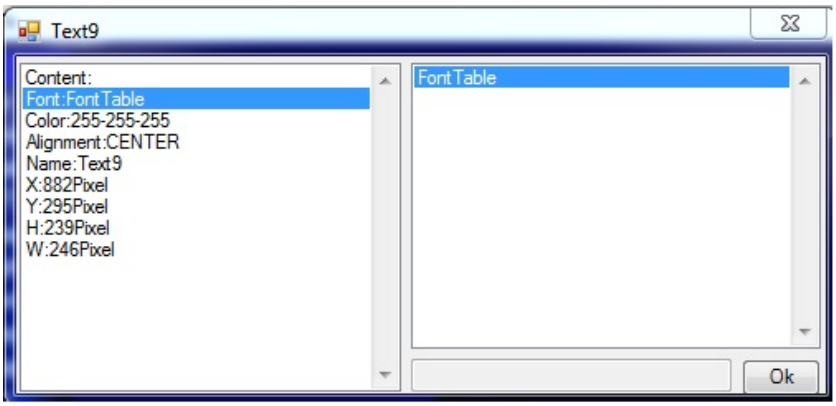

Figure 12.9 Analyze setting table, change the font

- Select the **Font**,**Font Style** and **Size** that you want and click on **OK**.

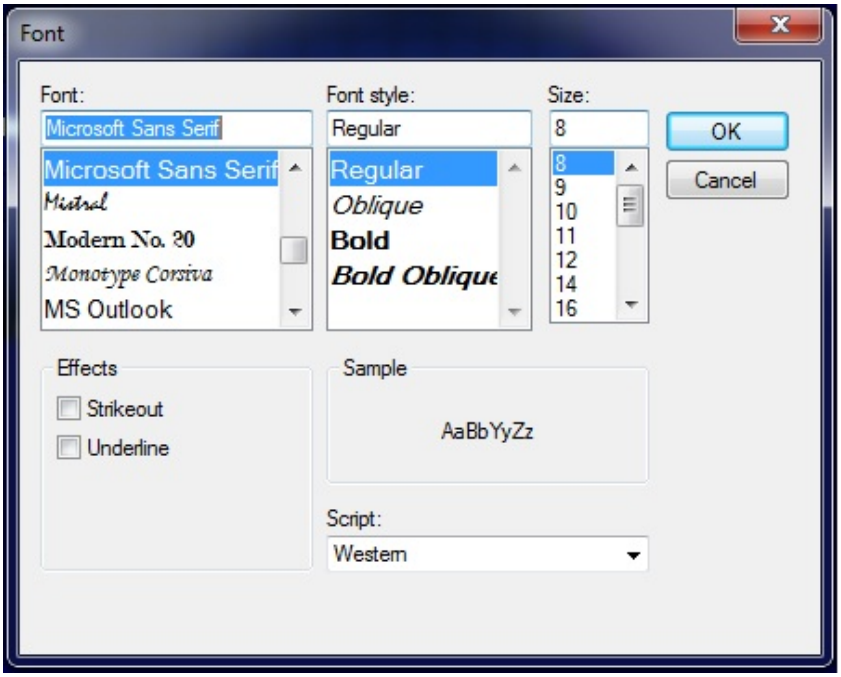

Figure 12.10 Font table

Figure 12.12 colortable

- Click on the item **Color** on the left side of the table and then click on the **Color Table** on the right side.

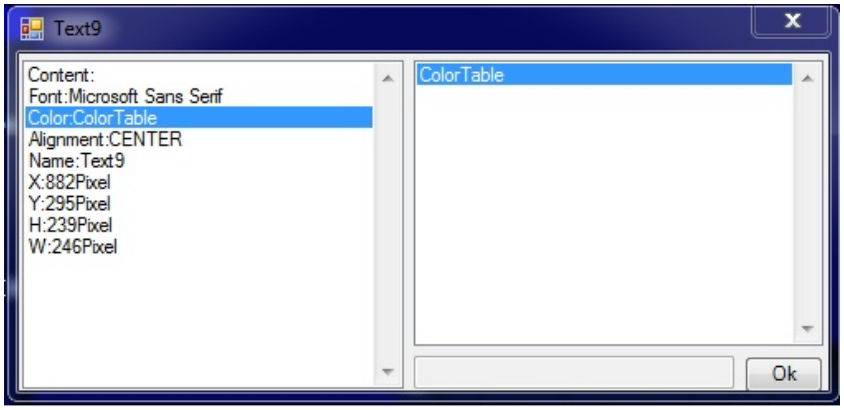

Figure 12.11 Analyze setting table, change the color

- Select the color that you want and click on **OK**.
- Click on the item **Alignment** on the left side of the table and then click on the **Right**, **Left** or **Center** to align the content in a way you like.

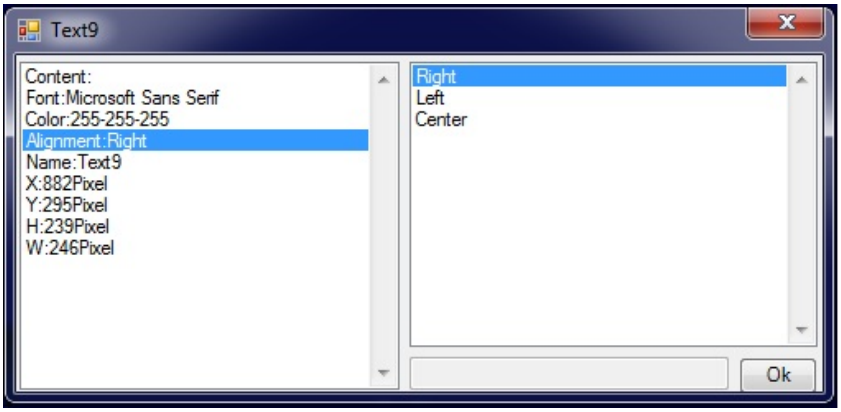

Figure 12.13 Analyze setting table, change the alignment

- Click on **Ok** and the content is displayed according to your desired properties.

12.4.4 Select Channel to Display

- Right click on the panel to open the setting table.
- Click on the item **Channel** on the left side of the table to change the channel.

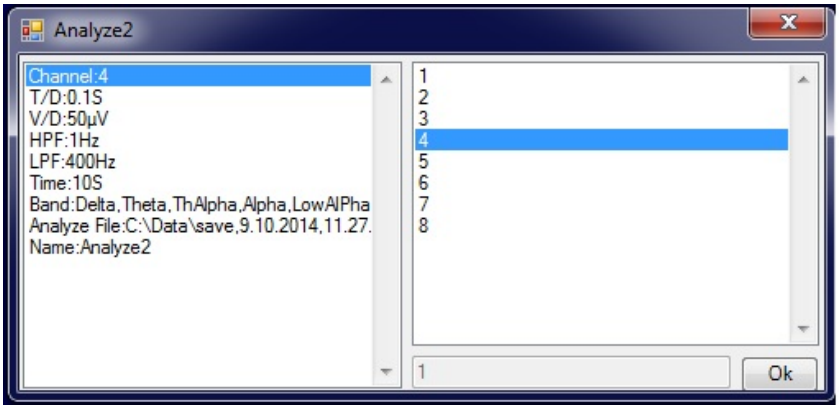

Figure 12.14 Analyze Setting table, select channel

- Click on one of the items on the right side of the table and select the channel you want to display.

12.4.5 Select Horizontal Scale

- Right click on the panel to open the setting table.
- Click on the item **T/D** on the left side of the table to change the horizontal scale.

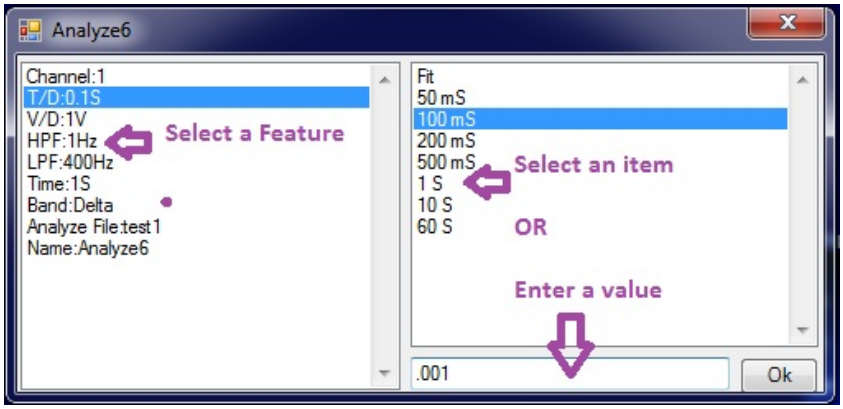

Figure 12.15 Analyze setting table, change the Time/Division (Horizontal Scale)

☞ The values you see in horizontal scale of the scope are not the current time of the data, they are just Time Divisions. If you want to see the current time, look at the **Time** button on the **PlayBox** panel (See sec. 5.7).

- Click on one of the items on the right side of the table or type your own value(You should enter a value on *volt* scale. e.g. .003 for $3mv$.).
- The horizontal scale is changed. Each of the grid box in the scope is now equal to the value you set as **T/D**.

12.4.6 Select Vertical Scale

- Right click on the panel to open the setting table.
- Click on the item **V/D** on the left side of the table to change the Vertical scale.
- Click on one of the items on the right side of the table or type your own value (You should enter a value on *volt* scale. e.g. .003 for $3mv$.)

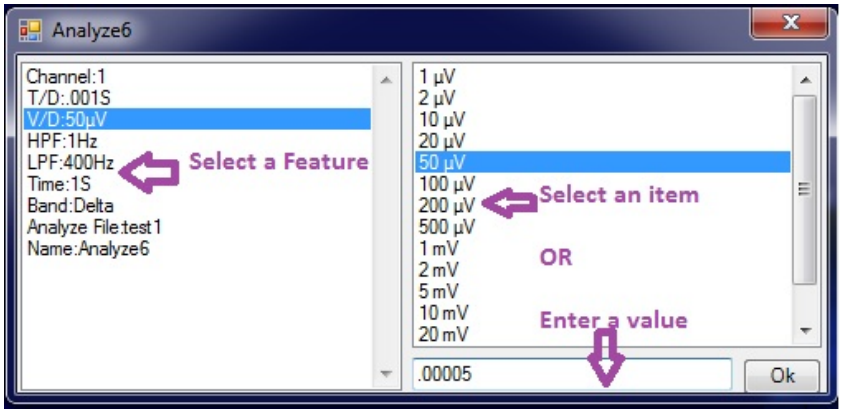

Figure 12.16 Analyze setting table, change Volt/Division (Vertical Scale)

- The vertical scale is instantly changed. You can see the data and select the best you want. Each of the grid box in the scope is now equal to the value you set as **V/D**.

12.4.7 Implement Filter to Data

- Right click on the panel to open the setting table.
- Click on the item **LPF** on the left side of the table to implement low pass filter or **HPF** for high pass filter.
- Click on one of the items on the right side of the table or type your own value to determine cut of frequency of the filter.

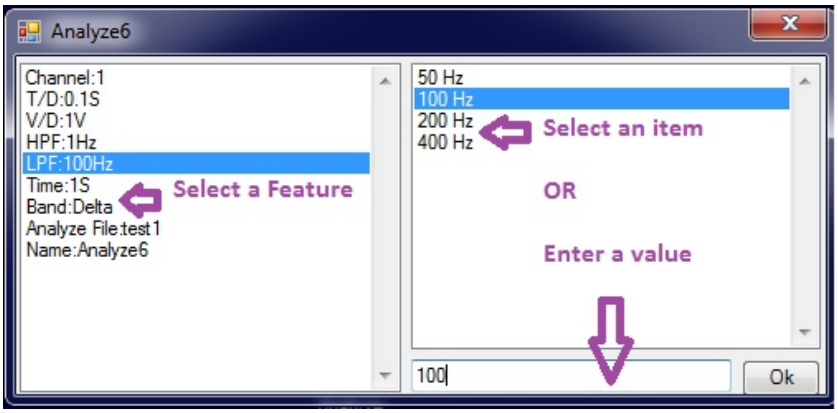

Figure 12.17 Analyze setting table, change cut of frequency of the filter

- The displayed data is filtered while the original data is the same.

12.4.8 Select Frequency Band to Analyze

- Right click the panel to open the setting table.
- Click on the item **Band** on the left side of the table to change the frequency bands that you want to see in horizontal scale. The frequency range of some predefined Bands are shown in table. 12.1

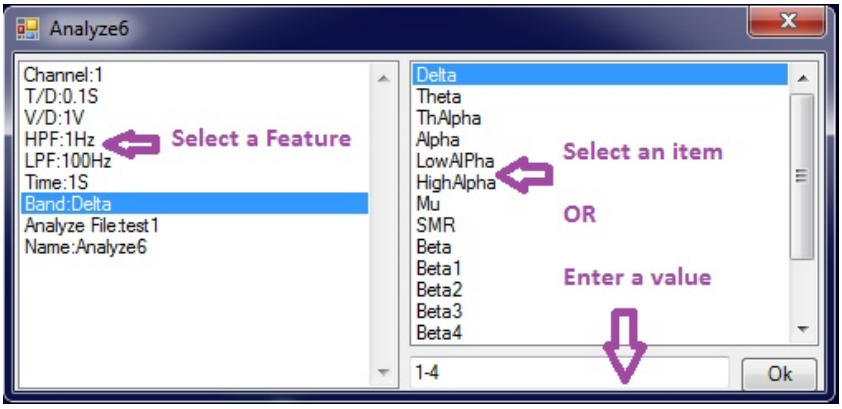

Figure 12.18 Analyze setting table, change the band

Delta: $1-4Hz$

Theta: $4-8Hz$

Thalpha: $6-10Hz$

Alpha: $8-12Hz$

LowAlpha: $8-10Hz$

HighAlpha: $10-12Hz$

Mu: $8-13Hz$

SMR: $12-15Hz$

Beta: $12-35Hz$

Beta1: $15-18Hz$

Beta2: $18-22Hz$

Beta3: $22-26Hz$

Beta4: $26-30Hz$

Beta5: $30-35Hz$

Gama: $35-100Hz$

LowArtifact: $43-59Hz$

HighArtifact: $1-2Hz$

Table 12.1 The Range of Frequency Bands

- Click on one of the predefined bands on the right side of the table or type your own frequency range(e.g. 1 – 50).
- The number of frequency bins is changed to cover the range that you set as **Bands**.

12.4.9 Select FFT Calculation Window Size

The FFT value is calculated online but it considers previous samples up to a specific window length. Selecting FFT window size, you can determine if you want to consider previous samples of one, two, four or eight seconds. If your data has sharp changes and you want to track changes in every second, then choose one second for FFT window size. If not, you can choose larger values.

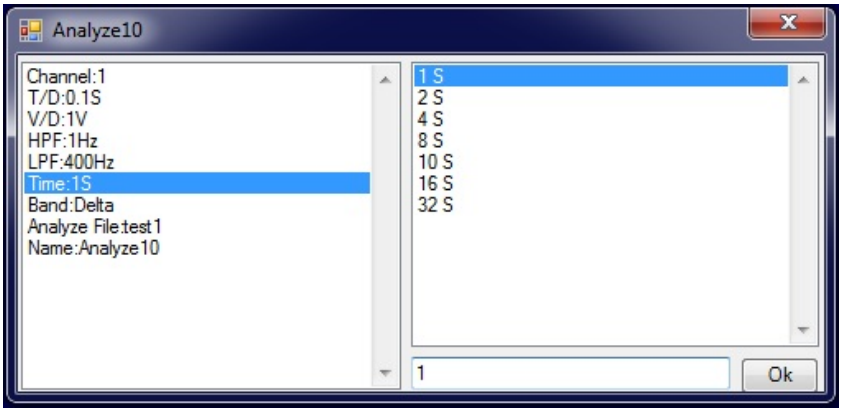

Figure 12.19 Analyze setting table, change FFT window size

- Right click on the panel to open the setting table.
- Click on the item **Time** on the left side of the table to change FFT window size.
- Click on one of the items on the right side of the table or enter a value to select the window size.

Chapter 13

Image

13.1 Image at a Glance

This panel shows image. You can select the image file you want to display.

Figure 13.1 Image

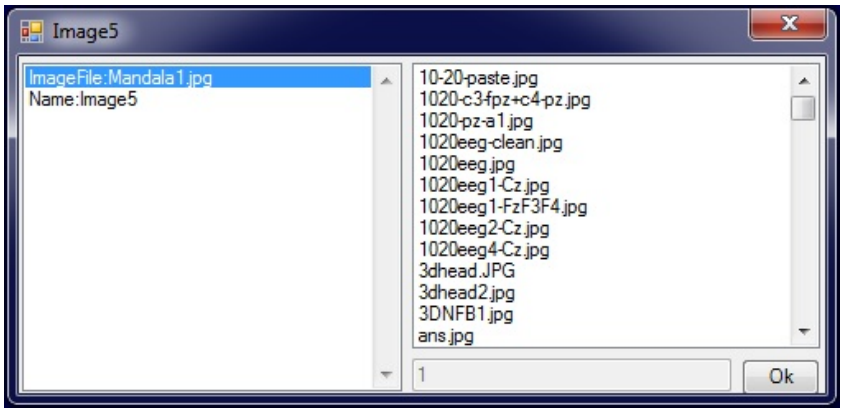

Figure 13.2 Image Setting Table

13.2 Image Setting Table

- **ImageFile**: You need to determine a file name of the image you want to display using the item **ImageFile**. Note that the ImageFile you want to select should be in the **Image** Folder in the protocol directory.
- **Name**: You can change the name of the panel using this item.

Extra Items

You can see some other options during **EditMode** (When you have pressed the **E** key on the keyboard and you can see **Edit toolbar** in the screen) including:

- **H**: You can change the height of the panel.
- **W**: You can change the height of the panel.
- **X**: You can change the position in x-axis.
- **Y**: You can change the position in y-axis.

13.3 Make a New Image Panel

Figure 13.3 Edit Toolbar

☞ You can edit panel only when you are in **Edit Mode** .i.e. you have pressed the **E** key on keyboard and you can see **Edit Toolbar** in the page.

- Run the **eWave Probe** to open the main menu.
- Click on **File** > **Open Protocol** to open a protocol or on **File** > **New Protocol** to create a new protocol. An editable page is opened.
- If the **Edit Toolbar** does not present in the page, press **E** key on the keyboard to see it. The **Edit Toolbar** (Fig. 13.3) is appeared in the left side of the page.
- Click on the item named **Image**. This item is highlighted.
- Click on the position of the page that you want to place the panel. The Image panel is now made with default size. You can change the size and position to the values you want.

13.3.1 Changing Size and Position

- If the **Edit Toolbar** does not present in the page, press **E** key on the keyboard to see it. Now, you are in **Edit Mode** and you can modify the panel.
- Click on the borders of the panel and drag the mouse to resize it.
- Click on the center of the panel and drag the mouse to move it.

An Alternative Way

If you want to specify the exact value of size and position do the following:

1. If the **Edit Toolbar** does not present in the page, press **E** key on the keyboard to see it. Now, you are in **Edit Mode** and you can modify the panel.
   - Right click on the panel to open the setting table.
   - Click on the item **H**, to change height, and type the value you want.

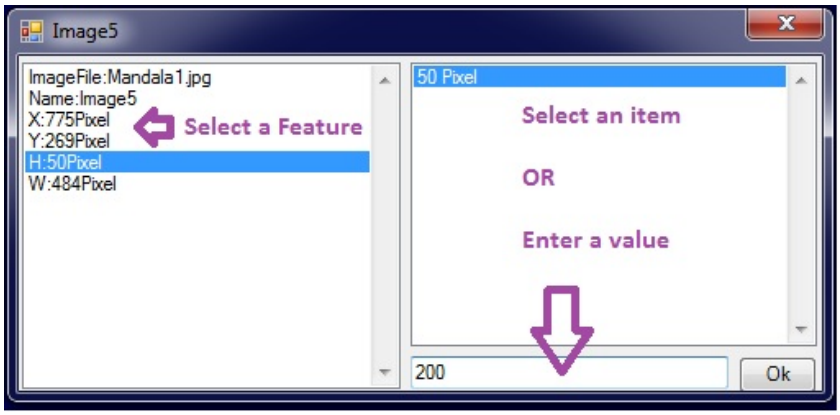

Figure 13.4 Image setting table

   - Click on the item **W**, to change Width, and type the value you want.
   - Click on the item **X**, to change the position in x-axis, and type the value you want.
   - Click on the item **Y**, to change the position in y-axis, and type the value you want.

☞ You can see these extra features in the setting table only when you are in **Edit Mode**.

13.4 Select Display Setting

13.4.1 Select the Image File Name to Display

You need to select a file name of the image you want to display.

- Right click the label of panel to open the setting table.
- Click on the item **GameFiles** on the left side of the table.

☞ You should put the image file in **Image** Folder in the protocol directory or else you can not see it in the right side of the table

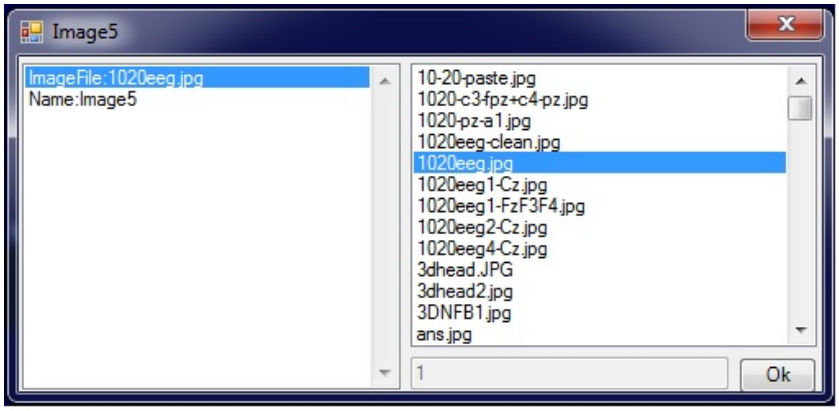

Figure 13.5 Image setting table, change Image File

- Click on one of the items on the right side of the table to select the image file.
- Click on **Ok**. The image is displayed.

Chapter 14

Game

This panel is for clients to play video, movie or game. It plays based on the client's brain waves that is reflected on Bar panels and according to the features that you specify. You can select the type of the game and the file that you want to display. You can also change the logic or rule that it should follow.

14.1 Game at a Glance

Figure 14.1 Game

14.2 Game Setting Table Properties

- **GameFiles**: For each selected Game type, you need to determine a file name (or folder name for Animation) using the item **GameFiles**. Note that the GameFiles you select should be relevant to the GameType you have been selected (or going to select). If not it cannot show anything.

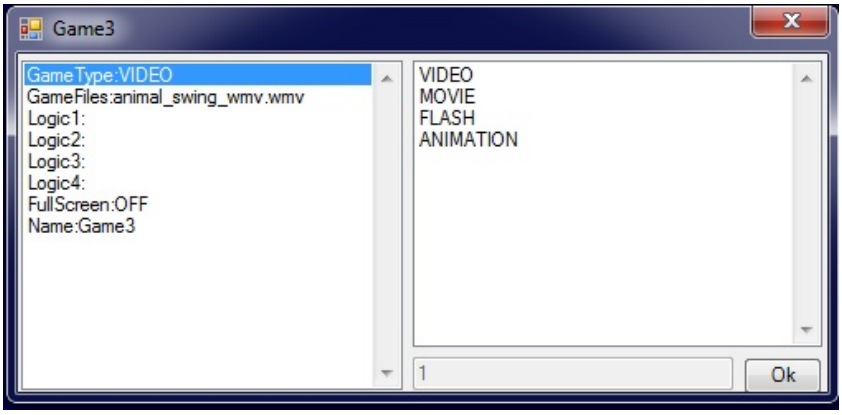

Figure 14.2 Game

- **GameType**: You have four options to choose the type of Game including: **Video**, **Movie**, **Flash** and **Animation**. You can choose the type you want using **GameType** item.
- **Logic1**, **Logic2**, **Logic3**, **Logic4**: You can control application of each Game using the output of one or multiple Bars. To do this, you should specify the name of the bar (or bars) that you want as **Logic1** , **Logic2**, **Logic3** or **Logic4** for the Game.
- **FullScreen**: You can use a separate monitor for the client using **FullScreen** item. In this case, you can show only game (not other panels) through full screen monitor to the client.
- **Name**: You can change the name of the panel using this item.

Extra Items

You can see some other options during **EditMode** (When you have pressed the **E** key on the keyboard and you can see **Edit toolbar** in the screen) including:

- **H**: You can change the height of the panel.
- **W**: You can change the height of the panel.
- **X**: You can change the position in x-axis.
- **Y**: You can change the position in y-axis.

14.3 Make a New Game Panel

- Run the **eWave Probe** to open the main menu.

- Click on **File** > **Open Protocol** to open a protocol or on **File** > **New Protocol** to create a new protocol. An editable page is opened.
- If the **Edit Toolbar** does not present in the page, press **E** key on the keyboard to see it. The **Edit Toolbar** (Fig. 14.3) is appeared in the left side of the page.
- Click on the item named **Game**. This item is highlighted.
- Click on the position of the page that you want to place the panel. The Game panel is now made with default size. You can change the size and position to the values you want.

Figure 14.3 Edit Toolbar

14.3.1 Changing Size and Position

- If the **Edit Toolbar** does not present in the page, press **E** key on the keyboard to see it. Now, you are in **Edit Mode** and you can modify the panel.
- Click on the borders of the panel and drag the mouse to resize it.
- Click on the center of the panel and drag the mouse to move it.

☞ You can edit panel only when you are in **Edit Mode** .i.e. you have pressed the **E** key on keyboard and you can see **Edit Toolbar** in the page.

☞ You can see these extra features in the setting table only when you are in **Edit Mode**.

An Alternative Way

If you want to specify the exact value of size and position do the following:

- If the **Edit Toolbar** does not present in the page, press **E** key on the keyboard to see it. Now, you are in **Edit Mode** and you can modify the panel.
- Right click on the panel to open the setting table.
- Click on the item **H**, to change height, and type the value you want.

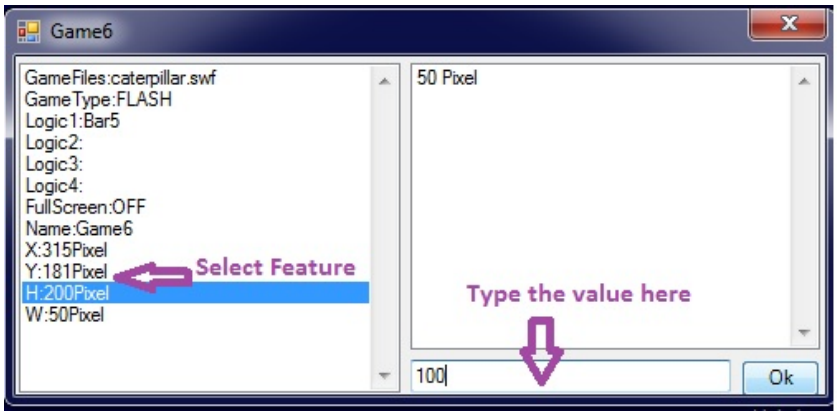

Figure 14.4 Game setting table

- Click on the item **W**, to change Width, and type the value you want.

- Click on the item **X**, to change the position in x-axis, and type the value you want.
- Click on the item **Y**, to change the position in y-axis, and type the value you want.

14.4 Select Display Setting

14.4.1 Select the Type of the Game

The panel Game covers four types of Game including: **Video**, **Movie**, **Flash** and **Animation**.

Game Types

- **Movie:** It is a movie or cartoon that is always playing but its size is changed based on the value of the bar.
- **Video:** It is a video with ordinary size that plays and stops based on the value of the bar.
- **Flash:** It is a computer game that runs based on the value of the bar.
- **Animation:** It is a set of consecutive images that each time an image is selected based on the value of the bar. The change in the value of the bar leads to the change in the selected image and produces an animation.

- Right click the label of the panel to open the setting table.
- Click on the item **Game Type** on the left side of the table.

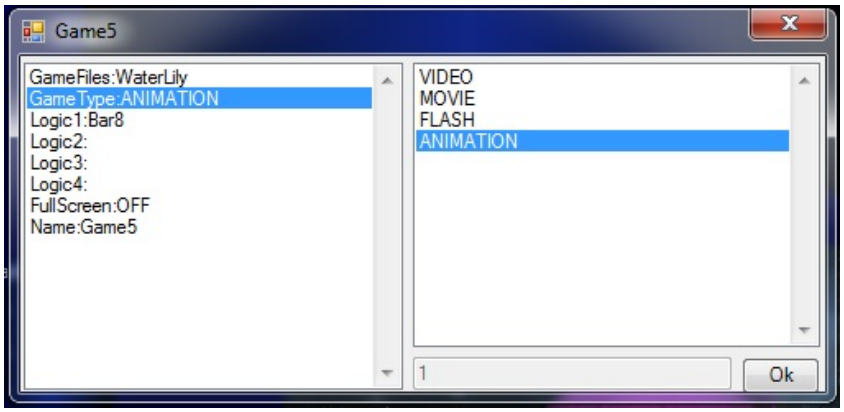

Figure 14.5 Game setting table, change Game Type

- Click on one of the items on the right side of the table to select a Game Type.

14.4.2 Select the Game File Name to Play

For each Game Type you need to select a file name (or folder name for Animation) to display.

- Right click on the label of panel to open the setting table.
- Click on the item **GameFiles** on the left side of the table.

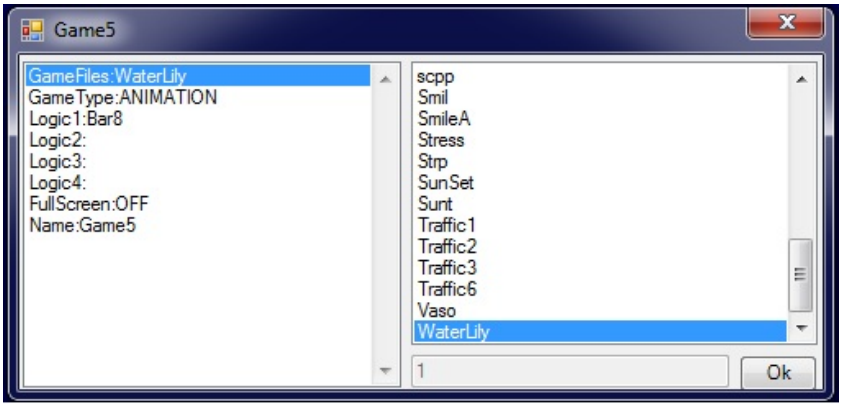

Figure 14.6 Game setting table, change Game File

- Click on one of the items on the right side of the table to select a Game File.

☞ The software cannot find the file, if you select a Game file that is for another Game Type (For example an Animation folder for a Flash Type)!

14.4.3 Select the Logic for the Game

You can control weather each Game plays or not using the output of one or multiple Bars. To do this, you should specify the name of the bar (or bars) that you want as **Logic** (or **Logic1**, **Logic2**, ⋯) for the Game.

- Right click the label of the panel to open the setting table.
- Click on one or multiple items of **Logic1**, **Logic2**, **Logic3** or **Logic4** on the left side of the table.

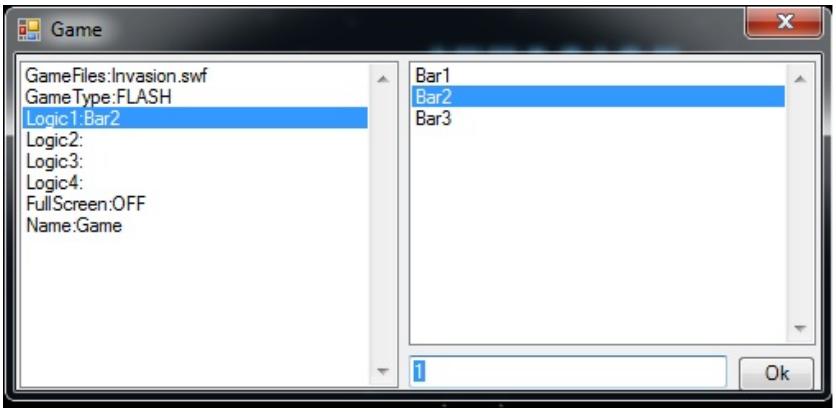

Figure 14.7 Game setting table, change Game Logic

☞ If you select multiple Logics they will be ORed to produce the final logic that affects game.

- Click on one or multiple items (name of the bars) that is appeared on the right side of the table or enter a name to select bars as logic.

14.4.4 Select the Full Screen Mode

You may want to use a separate monitor for the client to show him only game (not other panels) through full screen monitor. To do this, do the following and select full screen mode.

Figure 14.8 FullScreen Mode: using second monitor for client

- Push the plug on the end of the second monitor cable into your computer's video port and turn on the second monitor.
- Right click the label of the panel to open the setting table.
- Click on the item **FullScreen** on the left side of the table.

Figure 14.9 Game setting table, change FullScreen Mode

- Click on **ON** to activate or **OFF** to deactivate this mode.

Chapter 15

QEEG

15.1 QEEG at a Glance

QEEG

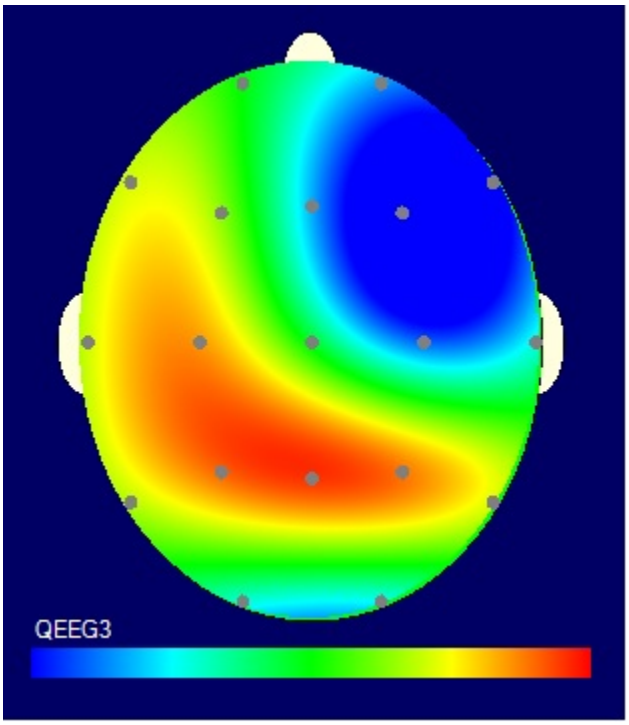

Figure 15.1 QEEG

15.2 QEEG Setting Table Properties

In the QEEG setting table you can see some items to change:

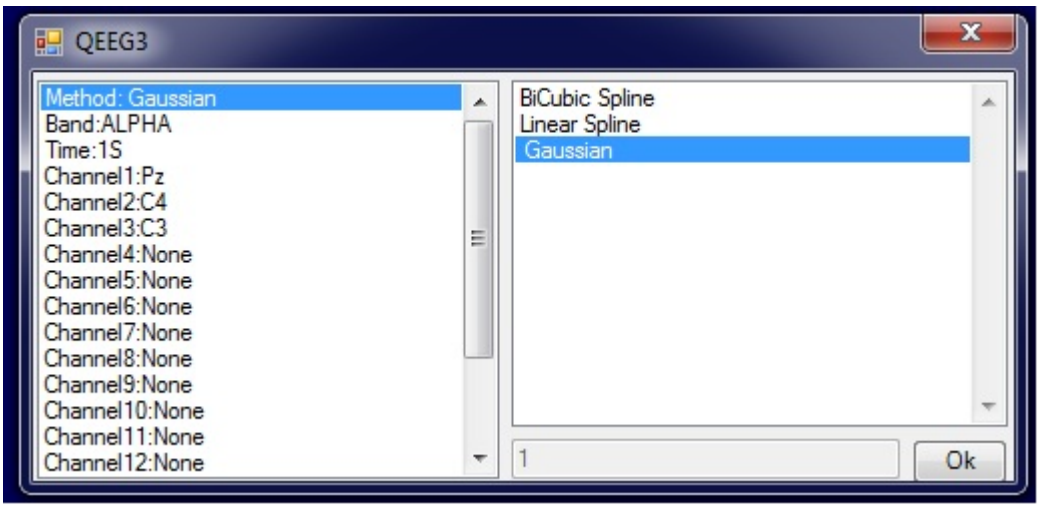

Figure 15.2 Qeeg setting

- **Method**: You can select one of the *Gaussian*,*Cubic Spline* or *Linear Spline* methods to calculate the QEEG.
- **Band**: You may want to see the FFT of specific EEG band or any other frequency band that you want. You can choose one of the predefined EEG bands on the setting table or enter a band in the forms of $StartBand - StopBand$.
- **Channel1**,**Channel2**, $\cdots$: You may use one or multiple channels and put the their leads on specific locations of the brain using 10/20 system. You can set the active channels and joint them with their corresponding lead names using these items.
- **Name**: You can change the name of the panel using this item.

Extra Items

You can see some other options during **EditMode** (When you have pressed the **E** key on the keyboard and you can see **Edit toolbar** in the screen) including:

- **H**: You can change the height of the panel.
- **W**: You can change the height of the panel.
- **X**: You can change the position in x-axis.
- **Y**: You can change the position in y-axis.

15.3 Make a New QEEG Panel

- Run the **eWave Probe** to open the main menu.
- Click on **File** > **Open Protocol** to open a protocol or on **File** > **New Protocol** to create a new protocol. An editable page is opened.
- If the **Edit Toolbar** does not present in the page, press **E** key on the keyboard to see it. The **Edit Toolbar** (Fig. 15.3) is appeared in the left side of the page.
- Click on the item named **QEEG**. This item is highlighted.
- Click on the position of the page that you want to place the panel. The QEEG panel is now made with default size. You can change the size and position to the values you want.

Figure 15.3 Edit Toolbar

15.3.1 Changing Size and Position

- If the **Edit Toolbar** does not present in the page, press **E** key on the keyboard to see it. Now, you are in **Edit Mode** and you can modify the panel.
- Click on the borders of the panel and drag the mouse to resize it.
- Click on the center of the panel and drag the mouse to move it.

☞ You can edit panel only when you are in **Edit Mode** .i.e. you have pressed the **E** key on keyboard and you can see **Edit Toolbar** in the page.

☞ You can see these extra features in the setting table only when you are in **Edit Mode**.

An Alternative Way

If you want to specify the exact value of size and position do the following:

- If the **Edit Toolbar** does not present in the page, press **E** key on the keyboard to see it. Now, you are in **Edit Mode** and you can modify the panel.
- Right click on the panel to open the setting table.
- Click on the item **H**, to change height, and type the value you want.

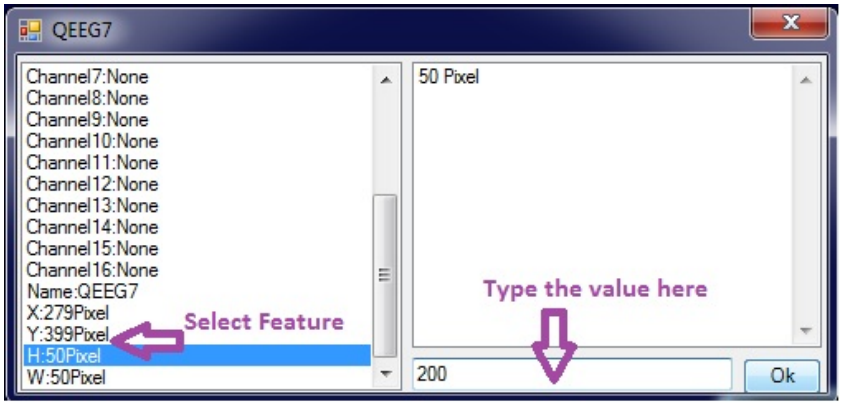

Figure 15.4 QEEG setting table, change size and position

- Click on the item **W**, to change Width, and type the value you want.
- Click on the item **X**, to change the position in x-axis, and type the value you want.
- Click on the item **Y**, to change the position in y-axis, and type the value you want.

15.4 Select Display Setting

15.4.1 Select the Calculation Method

- Right click the panel to open the setting table.
- Click on the item **Method** on the left side of the table to select the QEEG calculation method.

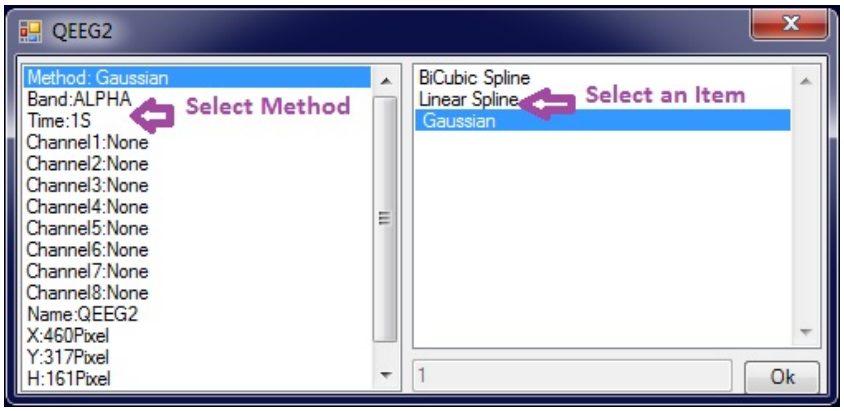

Figure 15.5 QEEG setting table, select QEEG calculation method

- Click on one of the items on the right side of the table or enter a value to select the window size.

15.4.2 Select Channels and Corresponding Electrode Positions

- Right click on the panel to open the setting table.
- Click on **Channel** number that you want on the left side of the table and click on the corresponding Lead name on the right side of the table.

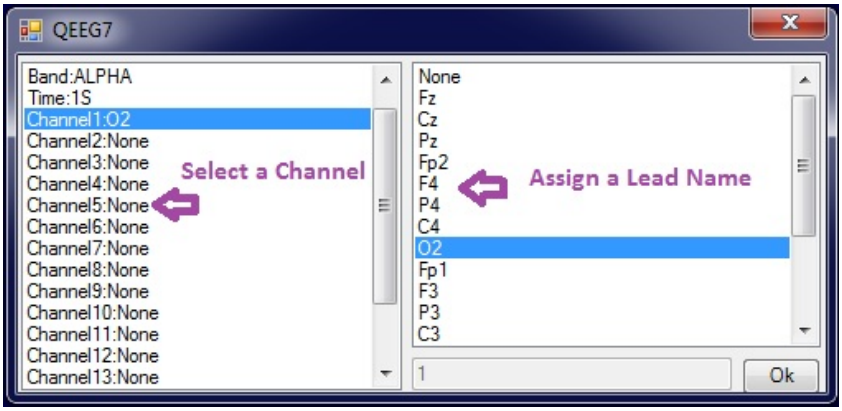

Figure 15.6 QEEG channel selection

15.4.3 Select the Frequency Band to Display

- Right click the panel to open the setting table.
- Click on the item **Band** on the left side of the table to change the frequency bands that you want to see in horizontal scale. The frequency range of some predefined shown in table. 15.1

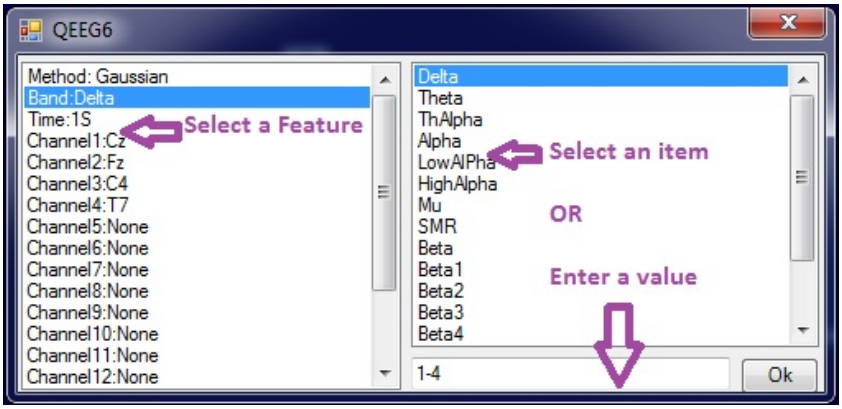

Figure 15.7 QEEG setting table, change band

- Click on one of the predefined bands on the right side of the table or type your own frequency range(e.g. $1-50$).
- The number of frequency bins is changed to cover the range that you set as **Bands**.

Delta: $1-4Hz$

Theta: $4-8Hz$

Thalpha: $6-10Hz$

Alpha: $8-12Hz$

LowAlpha: $8-10Hz$

HighAlpha: $10-12Hz$

Mu: $8-13Hz$

SMR: $12-15Hz$

Beta: $12-35Hz$

Beta1: $15-18Hz$

Beta2: $18-22Hz$

Beta3: $22-26Hz$

Beta4: $26-30Hz$

Beta5: $30-35Hz$

Gama: $35-100Hz$

LowArtifact: $43-59Hz$

HighArtifact: $1-2Hz$

Table 15.1 The Range of Frequency Bands

15.4.4 Select FFT Calculation Window Size

The FFT value is calculated online but it considers previous samples up to a specific window length. Selecting FFT window size, you can determine if you

want to consider previous samples of one, two, four or eight seconds. If your data has sharp changes and you want to track changes in every second, then choose one second for FFT window size. If not, you can choose larger values.

- Right click the panel to open the setting table.
- Click on the item **Time** on the left side of the table to change FFT window size.

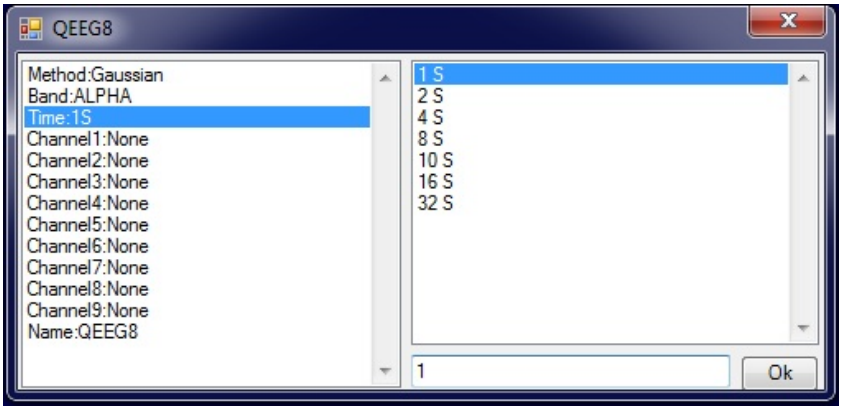

Figure 15.8 QEEG setting table, change FFT window size

- Click on one of the items on the right side of the table or enter a value to select the window size.

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